

airHaul™ Nexus sB3010



User Guide

Version 1.19

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About This Document

This User Guide is for the networking professional who configures and manages the smartBridges' Intelligent Nexus Platform of wireless backhauls (airHaul™ Nexus).

It provides detailed information on using the web-based configuration GUI to configure the airHaul Nexus unit. This manual will help you gain a better understanding of how the various components of Nexus work.

To configure smartBridges' products, you need to have a fundamental understanding of the concepts and technology of Local Area Networks (LAN) and wireless networking. The system installer will require expertise in the following areas:

- Outdoor radio equipment installation
- Network configuration
- Use of web browser for system configuration, monitoring and fault finding

In this chapter, you will find an overview of the User Guide and where to obtain additional information regarding installation and set-up.

Overview of User Guide

The airHaul Nexus sB3010 User Guide provides information on how to set-up and deploy the unit. A web-based management tool is provided to assist the user to configure the airHaul unit for different purposes.

In chapter 1, the configuration features of the web-based management tool and the system requirements are listed.

Chapter 2 explains how to login as an administrator and to change the default password. The features of the configuration page as well as the Navigation Menu Bar are explained. You will also learn how to configure the unit to Root Bridge mode and to convert from one mode to the other. Also in this chapter, instructions on modifying the configurations of the Root Bridge such as Ethernet, Wireless, Bandwidth, Radio parameters, Throughput Optimizer and Spanning Tree Protocol (STP) are given. Similar instructions are provided for the Remote Bridge and Remote Router. Finally, details on managing the wireless settings are provided.

Functions common to the different modes such as Link Performance parameters and Bandwidth Controller are explained in chapter 3.

The Site Survey Tool is explained in Chapter 4 and Chapter 5 shows how to perform antenna alignment to optimize the radio performance.

Upgrading the airHaul Nexus through the web management interface is shown in Chapter 6.

The System Configuration such as modifying the SNMP security settings and resetting the unit are given in Chapter 7. You will also learn how to save the configuration parameters as profiles and using the Link Budget Planning Tool.

Finally, Chapter 8 illustrates how to display Wireless and Ethernet Traffic Statistics through the 'Networking' | 'Statistics' drop down menu.

Related Publications

These documents provide complete information about the Nexus series of radio units: airHaul, airPoint™ and airClient™

- Quick Install Guide (QIG)
- Release Notes
- Technical Specification

All the information can also be found on our website at <http://www.smartbridges.com/>

Technical Support Center

Comprehensive technical support by dedicated smartBridges engineers is available to all customers through the smartBridges support center website. The website provides updated tools and documents to help troubleshoot and resolve technical issues related to smartBridges products and technologies. To access the technical support resources, please visit the support center website at <http://www.smartbridges.com/support/>

You will need to register for certain services and downloads on the smartBridges support center website.



1. Introduction

In this chapter, the configuration features of the web-based management tool and the system requirements are listed.

1.1. airHaul Nexus Configuration Features

The airHaul web-based management tool provides the user with the following features:

1. System configuration
2. Device operational mode configuration
3. Ethernet and wireless IP configurations
4. Radio (SSID, domain, channel, etc) parameter configuration
5. Network bridge (STP, etc) parameter configuration
6. Bandwidth management
7. Antenna alignment
8. Traffic Statistics
9. Site Survey
10. Profile management
11. User management
12. Link Test
13. Link Budget Planning Calculator
14. Firmware Upgrade

1.2. System Requirements

The following are the minimum system requirements for the airHaul Nexus web-based configuration management tool:

1. Operating System: either Windows 98/2000/XP/NT or Linux
2. Connection to the internet for downloading the latest firmware and Sun Java
3. Web browser: either Internet Explorer 5.0 and higher, Netscape 7.2 and higher, Mozilla 1.7 and higher or Mozilla Firefox 0.8 and higher
4. SUN JRE: v1.5 and above. You may download it from <http://java.sun.com/j2se/1.5.0/download.jsp>

Please visit <http://www.smartbridges.com/> for the latest information and updates.

1.3. Checklists

Pre-Installation Checklist for airHaul

Organization Name/Site Name	
Address	
City	
State	
Zip Code	
Telephone Number	

Site Survey and Link Planning				
No	Parameters	Units	Site A	Site B
1	Regulatory Standard to be followed	FCC/ETSI		
2	Frequency Band	2.4GHz 5.25-5.35 5.47-5.725 5.725-5.805		
3	Maximum Output Power as per the Regulatory Authority	100mW/1W/4W		
4	Latitude	Deg Min Sec		
5	Longitude	Deg Min Sec		
6	UPS Installed	Yes/No		
7	UPS specification if any	KVA		
8	Line Voltage	90V-264V AC,50-60 Hz		
9	Near Line of site between sites	Yes/No		
10	Height of tower	Feet/Meters		
11	Repeater required to achieve a link	Yes/No		
12	If Repeater required, then reason why	For example, to achieve long distance/LOS etc		
13	No. of repeaters required	Numbers		
14	Required Throughput	Mbps		
15	Distance between sites	Miles/Km		
16	Antenna Type	Parabolic/sector		
17	Antenna Mfg.	smartBridges/Name of other manufacturer		
18	Gain of antenna	dBi		
19	Antenna Polarization	Horizontal/Vertical		
20	Beam width of antenna	Horizontal - deg		
		Vertical – deg		
21	Type of external cable type	LMR 400/LMR600/etc		

No	Parameters	Units	Site A	Site B
22	Length of external cable connecting a Radio and antenna	Feet/meters		
23	Fade Margin taken into account for a link budgeting	Ideally between 10 to 20 dBm		
24	Model of smartBridges airHaul equipment selected for a link	sB3010		
25	Grounding- Earth to Neutral Voltage	Ideally less than 2 Volts		
26	Length of the Ethernet cable required for powering a unit	Feet/meters		
27	Choose the best channel which can be used on the basis of site survey with help of scanning tools such as Netstumbler	Specify channel number		

Pre Installation Lab Testing of Equipment				
No	Parameters	Units	Site A	Site B
1	Network diagram along with IP address of all the interfaces for link to be setup in Place	Yes/No		
2	Availability of Quick Installation Guide	Yes/No		
3	Availability of User guide and CD	Yes/No		
4	Ensure that all items listed in the "Package Contents" of Quick Installation Guide are included in the shipment	Yes/No		
5	Availability of Installation Kit	Yes/No		
6	Radio MAC address of airHaul	Yes/No		
7	Settings configured for pre-installation testing	Yes/No		
8	Ping response	ms		
9	Ping Success Rate	Percentage %		
10	Throughput test (Upload/Download)	Varies depending on signal strength, link quality and distance		

Note: Economical One radio model (sB3010)

As much as 15Mbps data throughput with a range of up to 25 miles (40km) range

Signature of Engineer:	
Name:	
Email:	
Date:	

Post-Installation Checklist for airHaul

Organization Name/Site Name	
Address	
City	
State	
Zip Code	
Telephone Number	

General Configuration Information				
No	Parameters	Units	Site A	Site B
1	Radio operations Mode	Root/ Remote Bridge or Router		
2	Mode of Operation	PTP		
3	SSID of a Radio	Up to 32 characters		
4	IP address of Ethernet Port	32-bit numeric address		
5	IP address of Wireless Port (for Router mode)	32-bit numeric address		
6	Noise Floor	dBm		
7	RSSI	dBm		
8	Channel selected for Link	Channel No		
9	Radio TX Output Power	-5 to +23dBm		
10	Antenna Gain	dBi		

Checklist				
No	Parameters	Units	Site A	Site B
1	Check out the crimping of the Ethernet cable at both the ends	Yes/No		
2	Check out the proper grounding of the antenna and equipment	Yes/No		
3	Ensure no extreme bends or kink's in the cable	Yes/No		
4	Ensure Ethernet cable is not running near a sharp edge	Yes/No		
5	Ensure airHaul along with antenna is fixed securely on a tower/mast with the help of nuts and bolt supplied in packaging	Yes/No		
7	Ping response	ms		
8	Ping success rate	Percentage		
9	Throughput test (Upload / Download)	Mbps		
10	Link stability based on observation for 1 Hr	Yes/No		

Signature of Engineer:	
Name:	
Email:	
Installation Date:	
Commissioned Date:	

For the latest information on smartBridges products, please visit our website at: <http://www.smartbridges.com/>

2. airHaul Nexus Configuration

Here you will learn how to login as an administrator and to change the default password to one of your choice. The features of the configuration page as well as the Navigation Menu Bar are explained. You will also learn how to configure the unit to Root Bridge mode and to convert from one mode to the other.

Also in this chapter, instructions on modifying the configurations of the Root Bridge such as Ethernet, Wireless, bandwidth control, radio performance parameters, Throughput Optimizer and Spanning Tree Protocol (STP) are given. Similar instructions are provided for the Remote Bridge and Remote Router.

Finally, details on managing the wireless settings are provided.

2.1. User Login and License Agreement

airHaul unit comes with the pre-configured default Ethernet (wired-side) IP address: **192.168.0.205** and subnet mask: 255.255.255.0. This default device IP address should be used when accessing the device configuration management interface for the first time using a web-browser (Enter <http://192.168.0.205> for the URL address). In addition, the Sun Java Plug-in should be installed. The PC must be on the same subnet as the airHaul unit.

Follow the steps below to login as an Administrator to the web-based configuration management interface system:

1. Connect the airHaul using the Power over Ethernet (PoE) to a PC or network via the ETH A or ETH B port (Please refer to the Quick Install Guide for more information on connections).
2. Open a web browser on the PC and enter the device's IP address **192.168.0.205** in the web browser address field and press **Enter**.
3. A user login box will appear. Enter the '**User name**' and '**Password**' and check the '**Remember my password**' checkbox if you want the system to remember the password. The default User name is **Administrator** and the password is **smartBridges** (case sensitive).



Figure 2-1 Administrator Login

4. Click the **'OK'** button. A License agreement page will appear as shown in Fig 2-2 below.
5. Click **'OK'**. The airHaul 'Nexus Summary Information' page (Fig 2-3) will appear.



Terms of use :

Terms of use

READ THE TERMS OF THIS AGREEMENT AND ANY PROVIDED SUPPLEMENTAL LICENSE TERMS FROM THE http://www.smartbridges.com/web/support/ah_nexus.asp link (COLLECTIVELY "AGREEMENT") CAREFULLY BEFORE USING THE SOFTWARE PACKAGE. BY USING THE SOFTWARE PACKAGE, YOU AGREE TO THE TERMS OF THIS AGREEMENT. IF YOU ARE ACCESSING THE SOFTWARE ELECTRONICALLY, INDICATE YOUR ACCEPTANCE OF THESE TERMS BY SELECTING THE "ACCEPT" BUTTON AT THE END OF THIS AGREEMENT. IF YOU DO NOT AGREE TO ALL THESE, SELECT THE "DECLINE" BUTTON AT THE END OF THIS AGREEMENT

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2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Please refer to the URL below for latest updates to the Software Warranty Statement http://www.smartbridges.com/web/support/ah_nexus.asp

Figure 2-2 License Agreement Page

Home	Networking	Radio	Tools	Help	Logout
Summary Info					
Summary Information : Operational mode : Root Bridge					
Wireless Configuration			Ethernet Configuration		
SSID	NEXUS_MASTER	IP Address	198.168.0.205		
Channel	60 - (5300 MHz)	IP Mask	255.255.255.0		
RSSI (dBm)	-54	Gateway	0.0.0.0		
Maximum Wireless Throughput (Kbps)	12288	DHCP	Disabled		
Port Information					
ETH A MAC Address	00:30:1A:1C:3D:ED				
ETH B MAC Address	00:30:1A:1C:3D:EE				
Radio MAC Address	00:30:1A:1F:4A:2E				

Figure 2-3 Nexus Summary Information Page

The page information descriptions are provided in the table below:

Table 2-1 Page Information Descriptions

Page Item		Descriptions
Ethernet Configuration	IP Address	Editable Ethernet IP Address.
	IP Mask	Editable Ethernet IP subnet Mask
	Gateway	Editable Gateway IP address.
	DHCP	Editable DHCP status Disabled/Enabled User can enable DHCP by ticking the check box to obtain an IP address from the network DHCP server
Wireless Configuration	SSID	Device SSID.
	Channel	Device operation channel.
	RSSI	RSSI value when associated
	Maximum Wireless Throughput	Maximum Wireless Throughput in kbps
Port Information	ETH A MAC Address	Ethernet A (wired side) MAC address. Display only
	ETH B MAC Address	Ethernet B (wired side) MAC address. Display only
	Radio MAC Address	Radio MAC address. Display only
Operational Mode	Device operational mode	Current device operational mode, either as Root Bridge, Remote Bridge or Remote Router

2.2. Web GUI Administrator Password Change

By default the Administrator password is **smartBridges** (case sensitive).

Follow the steps below to change the Administrator password.

1. Click on the **'Tools | User Manager'** drop down menu in the navigation menu bar. An **'Administrator Password change'** GUI will appear.
2. Enter the fields **'Old Password'**, **'new Authentication Password'** and **'Confirm new Authentication Password'** as shown in Figure 2-4.
3. Click on the **'Apply Changes'** button to effect the password change.

Tools : User Manager

[Operational mode : Root Bridge](#)

Administrator Password Change	
Enter Old Password :	*****
Enter new Authentication Password :	*****
Confirm new Authentication Password :	*****
Apply Changes	

Figure 2-4 Administrator password change

2.3. Using the Configuration Pages

The airHaul Nexus configuration system comprises several pages for configuring each parameter. A common navigation menu bar is provided at the top of each page for easy navigation as shown in the figure below.

Home	Networking	Radio	Tools	Help	Logout
Summary Info					
Summary Information :					
Operational mode : Root Bridge					
Wireless Configuration			Ethernet Configuration		
SSID		NEXUS_MASTER		IP Address	
Channel		60 - (5300 MHz)		IP Mask	
RSSI (dBm)		-54		Gateway	
Maximum Wireless Throughput (Kbps)		12288		DHCP	
				Disabled	
Port Information					
ETH A MAC Address		00:30:1A:1C:3D:ED			
ETH B MAC Address		00:30:1A:1C:3D:EE			
Radio MAC Address		00:30:1A:1F:4A:2E			

Figure 2-5 Navigation Menu Bar

System configuration information is displayed as read-only in each page. As shown in the 'Summary Information' page in the above figure, 'Ethernet Configuration', 'Wireless Configuration', 'Port Information' parameters are displayed as read only.

Clicking on the **UNDERLINED** parameter heading allows you to edit the configuration parameters. To change the 'Ethernet Configuration' parameters, click on the 'Ethernet Configuration' link. Similarly, clicking on the 'Wireless Configuration' link the 'Radio Configuration page' will be displayed to edit any wireless settings. The figure below shows the 'Ethernet Configuration' parameters in editable boxes.

To save the changes to the system, the user has to click on the 'Apply Changes' button.

Note: Clicking the web browser's **Back** button returns to the previous screen *without* saving any changes. Changes are saved only when the user clicks the 'Apply Changes' button

Summary Information :
airHaul (sB3010) - [Root Bridge mode](#)

Wireless Configuration		Ethernet Configuration	
SSID	aH_Demo_Root	IP Address	192 . 168 . 0 . 205
Channel	100 - (5500 MHz)	IP Mask	255 . 255 . 255 . 0
RSSI (dBm)	-6	Gateway	192 . 168 . 0 . 1
Maximum Wireless Throughput (Kbps)	15360	DHCP	☐

Figure 2-6 Editable Boxes for Parameter Editing

2.4. Navigation Menu Bar

The Navigation bar contains menu items that allow the user to go to different configuration pages. The following table summarizes the functions available for each of the menu item links.

Table 2-2 Menu Functions

Menu Item	Menu Sub-items	Description
Home	Summary Information	Displays summary page with information such as Ethernet and Wireless IP settings.
		Allows user to set the IP settings for Ethernet (wired side) and Wireless interfaces depending on the device operational mode.
	Bridge Configuration	Displays the bridge address, generic bridge port table, spanning tree port table for ports ETH A, ETH B, Radio A., etc
		Bridge configuration option is available when airHaul is configured in Root Bridge or Remote Bridge mode
Networking	DHCP Server	Configure DHCP server or Relay
		DHCP option is available only if airHaul is configured in Remote Router mode
	Traffic Statistics	Displays the Ethernet and Wireless Traffic Statistics
	Bandwidth Controller	Allows bandwidth management of the wireless link on egress traffic.
	Routing Table	Allows user to view, add and delete static routes.
		Routing table is only available for Remote Router mode.
Radio	Main	Wireless Settings: Allows user to set SSID, Channel,

Menu Item	Menu Sub-items	Description
		ACL Controls and Country, as well as Dial a Power. Provides a link to view associations. Performance: Allows user to set Fragmentation Length, RTS/CTS Length, Preamble Settings, Throughput Optimizer. Radio Operation mode is set to sB Enhanced Mode. Data Encryption: Allows user to set the WEP Keys and to choose between Open/Shared System modes of authentication. Wireless Traffic Statistics: Displays the Wireless Traffic Statistics
Tools	System Configuration	System Name: Allows user to change the name of the airHaul unit System Description: Allows user to enter a description of the airHaul unit SNMP Security: Allows user to set the SNMP Community String and SNMP Access Filters Reset: Resets the device remotely Delayed Reset: Schedules delayed reset NTP Server : Allows user to change NTP Server Settings Firmware Version: Shows firmware's current version

Menu Item	Menu Sub-items	Description
Tools	System Configuration	Radio Firmware Version: Shows firmware's current radio version Reset to Defaults: Resets the device with factory defaults Ethernet MTU Size: Allows user to set the Ethernet MTU size for different applications. Syslog server IP Address Allows user to set the Syslog server IP and log level. SNMP Trap server IP Address Allows user to set the SNMP Trap server IP for SNMP trap forwarding. LED Control Allows user to turn on/off LED control. Operational mode Set the Radio Operational mode
	Profile Manager	Save Profile Allows user to define and save up to three device operating profiles for easy device management. The installation profile is always available. Operating Profile Allows user to load the profile from saved profiles and shows last loaded profile Profile Calendar Allows user to plan and manage the use of different profiles at different times efficiently.
	Link Test	Allows user to do a throughput test and ping test. These tools could be very helpful during the installation phase.
	Link Budget Planning Calculator	Allows user to calculate the Link Budget.
Tools	Antenna alignment	Shows the link status, link quality, RSSI. This menu item is available when airHaul is configured in Remote Bridge mode or Remote Router mode

Menu Item	Menu Sub-items	Description
	Site Survey	Shows all the wireless devices operating in the area. This menu item is available when airHaul is configured in Remote Bridge mode or Remote Router mode
	User Manager	Allows the administrator to change the Administrator password.
	Firmware Upgrade	Allows user to update to new firmware versions.
Help	Technical Support	Information on Technical Support
	User Guide – Online	Links to online user guide
	Product Registration and Feedback	Allows user to register product and provide feedback or suggestions.
	Check for Updates	Check on smartBridges web site for any software updates.
	About airHaul Nexus	General system description, software version information and warranty information.

2.5. Device Mode Configuration

The current device operational mode is displayed at the top right hand corner of each page. The Device Mode Configuration allows the user to configure the airHaul Operational mode to Root Bridge, Remote Bridge or Remote Router mode.

By default, airHaul unit is set to Root Bridge Mode.

Follow the steps below to configure the airHaul unit in Root Bridge Mode:

1. Go to the **System Configuration** page and choose the Operational Modes available for airHaul: Root or Remote.

Note: The Root device can only be configured as a Bridge and the Remote device can be configured either as a Bridge or Router.

2. Click on the **Apply Changes** button to change the settings. The device will be rebooted and set to the chosen operational mode.

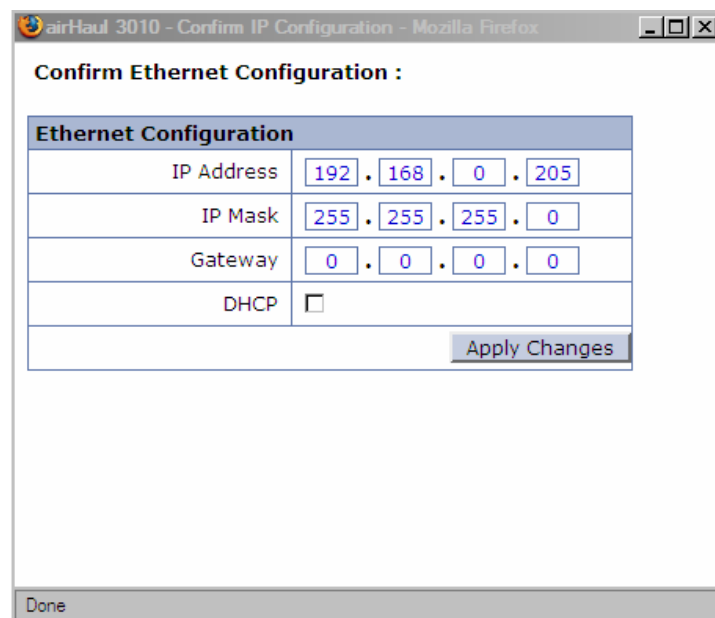
Home	Networking	Radio	Tools	Help	Logout
System Configuration :			airHaul (sB3010) - Root Bridge mode		
System Configuration					
System Name	Nexus				
System Description	Nexus				
SNMP Security	SNMP Security				
Reset	Reset				
Delayed Reset	Delayed Reset				
NTP Server	NTP Server Settings Time Server Not available				
Firmware Version	v1.00.10 Release Notes				
Radio Firmware Version	1.1.2.17				
Edit Configuration	IP Configuration Radio : Performance Data Encryption				
Reset To Factory Defaults	Reset To Defaults				
Ethernet MTU Size	1512 bytes				
Syslog server IP Address	0.0.0.0				Log level : -
SNMP Trap server IP Address	0.0.0.0				
Watch Guard	Suspended	for 5699 seconds	Enable	Suspend	
LED Control	On				
Current Operational Mode					
Root Device		Remote Device			
☒ Bridge		☐ Bridge			
		☐ Router			

Figure 2-7 Radio Operational Mode Settings

2.5.1 Root Bridge to Remote Bridge

Follow the steps below to change from Root Bridge mode to Remote Bridge mode:

1. Go to **Tools | System Configuration** drop down menu. The **System Configuration** will be displayed as shown below (Figure 2-8).
2. Alternatively, click on the **current device mode** link on the top right hand corner to go to the **System Configuration** page. .
3. Under Current Operational Mode, Select Remote Bridge and click on **Apply Changes**. A confirmation pop-up window will be displayed.
4. Enter IP Address, IP Mask and Gateway for **Ethernet Configuration**.
5. Click on the **Apply Changes** button to change the settings. The device will be rebooted and set to the chosen operational mode.



airHaul 3010 - Confirm IP Configuration - Mozilla Firefox

Confirm Ethernet Configuration :

Ethernet Configuration	
IP Address	192 . 168 . 0 . 205
IP Mask	255 . 255 . 255 . 0
Gateway	0 . 0 . 0 . 0
DHCP	☐

Apply Changes

Done

Figure 2-8 Changing Root Bridge to Remote Bridge

2.5.2 Root Bridge to Remote Router

Follow the steps below to change Root Bridge mode to Remote Router mode

1. Go to **Tools | System Configuration** drop down menu. The **System Configuration** will be displayed as shown below.
2. Alternatively, click on the **Current Device Mode** link on the top right hand corner to go to the **System Configuration** page.
3. Choose **Router** under the **Remote Device** option. Click on **Apply Changes**. A confirmation pop-up window will be displayed.
4. Enter IP Address, IP Mask and Gateway for **Ethernet and Wireless Configurations**.

- Click on the **Apply Changes** button to change the settings. The device will be rebooted and set to the chosen operational mode.

airHaul 3010 - Confirm IP Configuration - Mozilla Firefox

Confirm Ethernet and Wireless Configuration :

Ethernet Configuration	
IP Address	198 . 168 . 1 . 10
IP Mask	255 . 255 . 255 . 0

Wireless Configuration	
IP Address	198 . 168 . 0 . 206
IP Mask	255 . 255 . 255 . 0
Gateway	192 . 168 . 0 . 205
DHCP	☐

Apply Changes

Done

Figure 2-9 Changing Root Bridge to Remote Router

2.5.3 Remote Bridge to Root Bridge

Follow the steps below to change Remote Bridge mode to Root Bridge mode:

- Go to **Tools | System Configuration** drop down menu. The **System Configuration** will be displayed as shown below.
- Alternatively, click on the **Current Device Mode** link on the top right hand corner to go to the **System Configuration** page.
- Choose **Root Bridge** option and Click on **Apply Changes**. A confirmation pop-up window will be displayed.
- Enter IP Address, IP Mask and Gateway for **Ethernet Configuration**.
- Click on the **Apply Changes** button to change the settings. The device will be rebooted and set to the chosen operational mode.

Ethernet Configuration				
IP Address	192	168	3	205
IP Mask	255	255	255	0
Gateway	0	0	0	0
DHCP	☐			

Apply Changes

Done

Figure 2-10 Changing Remote Bridge to Root Bridge

2.5.4 Remote Router to Root Bridge

Follow the steps below to change Remote Router mode to Root Bridge mode:

1. Go to **Tools | System Configuration** drop down menu. The **System Configuration** will be displayed as shown below.
2. Alternatively, click on the **Current Device Mode** link on the top right hand corner to go to the **System Configuration** page.
3. Choose **Root Bridge** option and Click on **Apply Changes**. A confirmation pop-up window will be displayed.
4. Enter IP Address, IP Mask and Gateway for **Ethernet Configuration**.
5. Click on the **Apply Changes** button to change the settings. The device will be rebooted and set to the chosen operational mode.

airHaul 3010 - Confirm IP Configuration - Mozilla Firefox

Confirm Configuration :

Ethernet Configuration				
IP Address	192	168	3	205
IP Mask	255	255	255	0
Gateway	0	0	0	0
DHCP	☐			
Apply Changes				

Done

Figure 2-11 Changing Remote Router to Root Bridge

2.5.5 Remote Router to Remote Bridge

Follow the steps below to change Remote Router mode to Remote Bridge Mode:

1. Go to Tools | System Configuration drop down menu. The **System Configuration** will be displayed as shown below.
2. Alternatively, click on the **Current Device Mode** link on the top right hand corner to go to the **System Configuration** page.
3. Choose **Bridge** under the **Remote Device** option.
4. Click on **Apply Changes**. A confirmation pop-up window will be displayed.
5. Enter IP Address, IP Mask and Gateway for **Ethernet Configuration**.
6. Enter the MAC address and the SSID of the remote radio.
7. Enter the Channel and Domain.
8. Click on the **Apply Changes** button to change the settings. The device will be rebooted and set to the chosen operational mode.

airHaul 3010 - Confirm IP Configuration - Mozilla Firefox

Confirm Configuration :

Wireless Configuration	
SSID	NEXUS_MASTER
MAC Address	00:30:1A:
Domain	FCC
Channel	1 - (2412 MHz)

Ethernet Configuration	
IP Address	192 . 168 . 3 . 205
IP Mask	255 . 255 . 255 . 0
Gateway	0 . 0 . 0 . 0
DHCP	☐

Apply Changes

Done

Figure 2-12 Changing Remote Router to Remote Bridge

2.5.6 Remote Bridge to Remote Router

Follow the steps below to change Remote Bridge mode to Remote Router mode

1. Go to **Tools | System Configuration** drop down menu. The **System Configuration** will be displayed as shown below.
2. Alternatively, click on the **Current Device Mode** link on the top right hand corner to go to the **System Configuration** page.
3. Choose **Router** under the **Remote Device** option.
4. Click on **Apply Changes**. A confirmation pop-up window will be displayed.
5. Enter IP Address, IP Mask and Gateway for **Ethernet Configuration** and **Wireless Configuration**.
6. Enter the SSID and the Domain of a remote radio.
7. Click on the **Apply Changes** button to change the settings. The device will be rebooted and set to the chosen operational mode.

airHaul 3010 - Confirm IP Configuration - Mozilla Firefox

Confirm Ethernet and Wireless Configuration :

Ethernet Configuration	
IP Address	192 . 168 . 3 . 205
IP Mask	255 . 255 . 255 . 0

Wireless Configuration	
IP Address	192 . 168 . 1 . 2
IP Mask	255 . 255 . 255 . 0
Gateway	0 . 0 . 0 . 0
DHCP	☐
SSID	NEXUS_MASTER
Domain	FCC

Apply Changes

Done

Figure 2-13 Changing Remote Bridge to Remote Router

2.6. Root Bridge Configuration

The airHaul unit is configured in Root Bridge mode for use as a Root device. This section provides information on configuring in this mode.

2.6.1 Ethernet Configurations

The Ethernet (wired-side) parameters need to be configured for the Root Bridge device to communicate with the wired LAN network. The airHaul Nexus unit supports two Ethernet ports configured as a bridge. The **Ethernet Configuration** provides configuration for the bridge IP parameters.

Follow the steps below to change the Root Bridge Ethernet Configurations:

1. From the **Summary Information** page, click on the **Ethernet Configuration** link.
2. Enter a new **IP Address**, **IP Mask**, **Gateway** and **DHCP** status (checked if it is enabled, otherwise uncheck to disable it). If DHCP is checked the IP address will be assigned by the DHCP server in the network. If there is no DHCP server, the device will revert to the previous IP address after 60 seconds.
3. Click on the **Apply Changes** button to change the settings.

Home	Networking	Radio	Tools	Help	Logout																				
Summary Information :			airHaul (sB3010) - Root Bridge mode																						
<table border="1"> <thead> <tr> <th colspan="2">Wireless Configuration</th> </tr> </thead> <tbody> <tr> <td>SSID</td> <td>aH_Demo_Root</td> </tr> <tr> <td>Channel</td> <td>100 - (5500 MHz)</td> </tr> <tr> <td>RSSI (dBm)</td> <td>-6</td> </tr> <tr> <td>Maximum Wireless Throughput (Kbps)</td> <td>15360</td> </tr> </tbody> </table>			Wireless Configuration		SSID	aH_Demo_Root	Channel	100 - (5500 MHz)	RSSI (dBm)	-6	Maximum Wireless Throughput (Kbps)	15360	<table border="1"> <thead> <tr> <th colspan="2">Ethernet Configuration</th> </tr> </thead> <tbody> <tr> <td>IP Address</td> <td> 192 . 168 . 0 . 205 </td> </tr> <tr> <td>IP Mask</td> <td> 255 . 255 . 255 . 0 </td> </tr> <tr> <td>Gateway</td> <td> 192 . 168 . 0 . 1 </td> </tr> <tr> <td>DHCP</td> <td>☐</td> </tr> </tbody> </table>			Ethernet Configuration		IP Address	192 . 168 . 0 . 205	IP Mask	255 . 255 . 255 . 0	Gateway	192 . 168 . 0 . 1	DHCP	☐
Wireless Configuration																									
SSID	aH_Demo_Root																								
Channel	100 - (5500 MHz)																								
RSSI (dBm)	-6																								
Maximum Wireless Throughput (Kbps)	15360																								
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IP Mask	255 . 255 . 255 . 0																								
Gateway	192 . 168 . 0 . 1																								
DHCP	☐																								
<table border="1"> <thead> <tr> <th colspan="2">Port Information</th> </tr> </thead> <tbody> <tr> <td>ETH A MAC Address</td> <td>00:30:1A:1C:48:33</td> </tr> <tr> <td>ETH B MAC Address</td> <td>00:30:1A:1C:48:34</td> </tr> <tr> <td>Radio MAC Address</td> <td>00:30:1A:1F:4E:33</td> </tr> </tbody> </table>			Port Information		ETH A MAC Address	00:30:1A:1C:48:33	ETH B MAC Address	00:30:1A:1C:48:34	Radio MAC Address	00:30:1A:1F:4E:33	Apply Changes														
Port Information																									
ETH A MAC Address	00:30:1A:1C:48:33																								
ETH B MAC Address	00:30:1A:1C:48:34																								
Radio MAC Address	00:30:1A:1F:4E:33																								

Figure 2-14 Root Bridge Ethernet Configurations

2.6.2 Wireless Configurations

The wireless parameters need to be configured for the Root Bridge device to communicate with other airHaul Remotes.

Follow the steps below to change the Root Bridge Wireless Configurations:

1. From the **Summary Information** page, click on the **Wireless Configuration** link.
2. The **Radio Configuration** page will appear, click on the **Wireless Settings** link.
3. Enter the **SSID** of the unit and select the channel.
4. Enter the Remote unit radio's MAC address in the **Client Authorization MAC** and designate it as a Bridge or Router. The **Client Authorization MAC** setting is an ACL and it allows the root device to filter client MAC for association.
5. Select the Transmit power of the radio from **Dial-in-Power** drop down menu.
6. Select the gain of the antenna from the drop down menu as per the gain of the antenna being used with the equipment.
7. Enter the RF cable loss based on the cable specifications.
8. Click on the **Apply Changes** button to change the settings.

Home	Networking	Radio	Tools	Help	Logout
Main - Root Bridge					
Radio Configuration : Root Bridge - Main				Operational mode : Root Bridge	
Wireless Settings					
SSID	NEXUS_MASTER		Domain	FCC	
Channel	60 - (5300 MHz)				
Dial a Power	7 dBm	Antenna Gain (dBm):	23	RF Cable Loss(dBm) :	3
Client Authorization MAC	00:30:1A:1F:49:0F		☒ Router ☐ Bridge		
View Association Table					Apply Changes

Figure 2-15 Root Bridge Wireless Settings

The following table summarizes the information for the wireless settings.

Table 2-3 Wireless Settings

Page Items	Descriptions
SSID	This is the current SSID. User can change the SSID. The SSID is a unique identifier that wireless networking devices use to establish and maintain wireless connectivity. It is case sensitive and can contain up to 32 alphanumeric characters. Do not include special characters in the SSID.
Domain	This is the current radio regulatory domain. User can choose the appropriate domain. The pull-down menu shows a list of domains supported by radio. Different domains will show different channel lists.
Channel	This is the current radio channel in the selected domain. User can choose other channels from the pull-down list. For most consistent performance after a site survey, we recommend that user selects a non-overlapping channel setting for the radio. The radio channel settings correspond to the frequencies available in the user regulatory domain.
Dial a Power	Dial a Power is used to set the output power of the radio at the N Connector. The valid radio power range is from -5 dBm to 23 dBm
Antenna Gain	This is a gain of an antenna attached with the airHaul unit. The gain input here is merely for the purpose of display and calculation of the EIRP. User can select anywhere between 2.2dBi to 30 dBi.
RF cable Loss	This refers to the loss of a cable connecting antenna to the airHaul unit
Client Authorization MAC	This is the Radio MAC address of the Remote which is allowed to access the Root Device Access Control List (ACL) allows/denies access based on the client MAC address. Also mention the operation mode of the airHaul Remote device – Router / Bridge
View Association Table	List all associated clients and its link status.

Note: The default value for Dial a Power is 18 dBm for FCC domain.
At high TX power levels, the radio tends to distort EVM due to the amplifier saturation. In that case, use a value lower than the maximum power level especially in the 5Ghz band.

The figure below shows the list of clients associated with the airHaul Root Bridge device.

Association Table			
Index	MAC Address	RSSI (dBm)	
1	00:30:1A:1F:49:32	-88	Link Status

Refresh

(Data will refresh automatically after every 30 seconds)

Figure 2-16 Root Bridge Association List

The MAC Address of the Link Status is the radio MAC of the associated remote device. The RSSI (Received Signal Strength Indication) is measured in dBm.

Click on the **Link Status** link to view the Link Status graph (Figure 2-17) below.

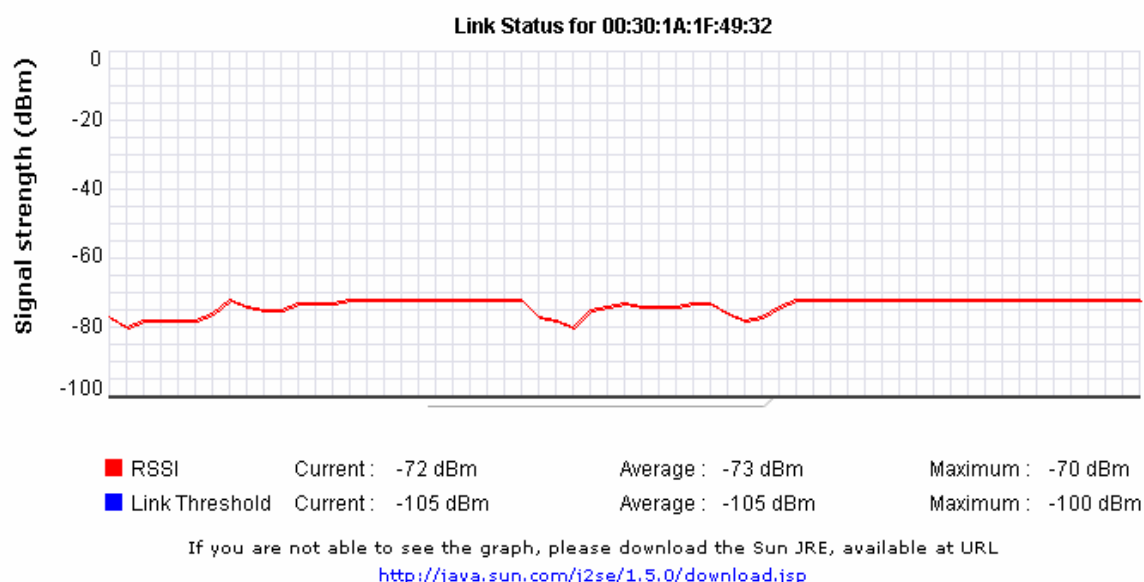


Figure 2-17 Remote Link Status

2.6.3 Bridge Configuration

In Bridge mode the airHaul unit acts as a transparent bridge between the Radio and the Ethernet interfaces. Figure 2-18 below shows the bridge configuration and the bridge forwarding table information. The STP (Spanning Tree Protocol) is disabled by default.

Networking : Bridge Configuration

[Operational mode : Root Bridge](#)

Bridge Configuration			
Bridge Address	00:30:1A:1C:3A:E9	Number of Ports	3
Type of Bridging	Transparent	Spanning Tree Protocol	Disable ▾

[Transparent Aging Time](#) : 300 (seconds)

Forwarding Table for Transparent Bridge			
Sr.no	MAC Address	Port Number	Local?
1	00:30:1A:1F:49:A7	3	yes
2	00:30:1A:1C:3A:EA	2	yes
3	00:30:1A:1C:3A:E9	1	yes
4	00:30:1A:01:98:09	2	no

Refresh

Figure 2-18 Bridge Configuration Information

2.6.4 Configuring Spanning Tree Protocol (STP)

STP is a Layer 2 link management protocol that provides path redundancy while preventing loops in the network. For a Layer 2 Ethernet network to function properly, only one active path can exist between any two redundant links.

To create a fault-tolerant network, there needs to be a loop-free path between all nodes in the network. The Spanning Tree Algorithm calculates the best loop-free path throughout a Layer 2 network. Infrastructure devices such as wireless bridges and switches send and receive spanning tree frames, called Bridge Protocol Data Units (BPDUs), at regular intervals. The devices do not forward these frames but use them to construct the loop-free path.

Multiple active paths among end stations cause loops in the network. If a loop exists in the network, end stations might receive duplicate messages. Infrastructure devices might also learn end-station MAC addresses on multiple Layer 2 interfaces. Such conditions result in an unstable network.

STP defines a tree with a root bridge and a loop-free path from the root to all infrastructure devices in the Layer 2 network.

STP forces redundant data paths into a standby (blocked) state. If a network segment in the spanning tree fails and a redundant path exists, the Spanning Tree Algorithm recalculates the spanning tree topology and activates the standby path.

When two interfaces on a device are part of a loop, the spanning tree port priority and path cost settings determine which interface is put in the forwarding state and which is put in the blocking state. The port priority value represents the location of an interface in the network topology and how well it is located to pass traffic. The path cost value represents the media speed.

2.6.5 STP Settings Configuration

STP is disabled by default. The table below lists the default STP settings when the STP is enabled.

Table 2-4 Default STP Values

Setting	Default Value	Range	Purpose
Bridge priority	32768	0-65535	A parameter used to identify the root bridge in a spanning tree (instance of STP). The bridge with the lowest value has the highest priority and is the root
Bridge max age	20	6-40	The interval a bridge will wait for a hello packet from the root bridge before initiating a topology change
Bridge hello time	2	1-10	The interval of time between each configuration BPDU sent by the root bridge.
Bridge forward delay	15	4-30	The period of time a bridge will wait (the listen and learn period) before beginning to forward data packets.
Ethernet port (ETH A) path cost	100	0-65535	The cost of using the port to reach the root bridge. When selecting among multiple links to the root bridge, STP chooses the link with the lowest path cost and blocks the other paths. Each port type has its own default STP path cost.
Ethernet port (ETH A) priority	128	0-255	The preference that STP gives to this port relative to the other ports for forwarding traffic out of the spanning tree. A higher numerical value means a lower priority; thus, the highest priority is 8.
Ethernet port (ETH B) path cost	100	0-65535	The cost of using the port to reach the root bridge. When selecting among multiple links to the root bridge, STP chooses the link with the lowest path cost and blocks the other paths. Each port type has its own default STP path cost.
Ethernet port (ETH B) priority	128	0-255	The preference that STP gives to this port relative to the other ports for forwarding traffic out of the

Setting	Default Value	Range	Purpose
			spanning tree. A higher numerical value means a lower priority; thus, the highest priority is 8.
Radio port (Radio A) path cost	100	0-65535	The cost of using the port to reach the root bridge. When selecting among multiple links to the root bridge, STP chooses the link with the lowest path cost and blocks the other paths. Each port type has its own default STP path cost.
Radio port (Radio A) priority	128	0-255	The preference that STP gives to this port relative to the other ports for forwarding traffic out of the spanning tree. A higher numerical value means a lower priority; thus, the highest priority is 8.

The Radio and Ethernet interfaces are assigned to bridge group by default. When the user enables STP and assigns a priority on bridge, STP is enabled on the radio and Ethernet interfaces. The interfaces adopt the priority assigned to bridge.

The user can edit the STP Priority, Bridge Max age, Bridge hello time, Forward Delay, STP Port priority and STP Port Path cost.

The **Transparent Aging Time** determines the time to refresh entries in the Forwarding Table. The Transparent Aging Time default value is **300** seconds.

Follow the steps below to configure the bridge STP for device in Root Bridge or Remote Bridge:

1. Click on **Networking | Bridge Configuration** to access the Bridge Configuration page.
2. Choose **Enable** from the Spanning Tree Protocol pull down list.
3. Click on the **Generic Bridge Port Table** link to change the Generic Parameters.
4. Enter a value for the **STP Priority**.
5. Enter values for the **Bridge Max Age**, **Bridge Hello Time** and **Bridge Forward Delay**
6. Click on **Transparent Aging Time** link to change the **Transparent Aging Time**.
7. Click on the **Spanning Tree Port Table** link to change the 'STP Ethernet Port' parameters.
8. Enter the values of Ethernet Port Priority and/or Port Path Cost for ETH A
9. Enter the values of Ethernet Port Priority and/or Port Path Cost for ETH B

10. Enter the values of Ethernet Port Priority and/or Port Path Cost for Radio A

11. Click on **Apply Changes** Button to save to the current configuration file.

Bridge Configuration			
Bridge Address	00:30:1A:1C:3A:E9	Number of Ports	3
Type of Bridging	Transparent	Spanning Tree Protocol	Enabled

Generic Bridge Port Table		Spanning Tree Port Table			
Protocol Specification	0		ETH A	ETH B	Radio A
STP Priority	32768	Port	1	2	3
Topology change Timer	0	Port Priority	128	128	128
STP designated Root	8000.00301a1c3ae9	Port State	Forwarding	Forwarding	Forwarding
STP Root Cost	0	Port Enable	Yes	Yes	Yes
STP Root Port	0	Port Path Cost	100	100	100
Bridge Max Age	20 (seconds)	Port Designated Root	8000.00301a1c3ae9	8000.00301a1c3ae9	8000.00301a1c3ae9
Bridge Hello Time	2 (seconds)	Port Designated Cost	0	0	0
Bridge Forward Delay	15 (seconds)	STP Designated Port	8001	8002	8003

[Transparent Aging Time](#) : **300** (seconds)

Forwarding Table for Transparent Bridge			
Sr.no	MAC Address	Port Number	Local?
1	00:30:1A:1F:49:A7	3	yes
2	00:30:1A:1C:3A:EA	2	yes
3	00:30:1A:1C:3A:E9	1	yes
4	00:30:1A:01:98:09	2	no

Figure 2-19 Bridge Configuration

2.7. Remote Bridge Configuration

The airHaul units can also be configured to operate as a Remote device to associate with Root Bridge. In Remote mode, the unit can operate as a bridge or a router.

Follow the steps in section 2.7.1 to 2.7.5 to configure the device in Remote Bridge mode.

2.7.1 Ethernet Configuration

The Ethernet IP is configured during the operational mode change to Remote Bridge mode.

Follow these steps below if you need to re-configure the Remote Bridge Ethernet parameters:

1. From the **Summary Information** page, click on the **Ethernet Configuration** link to change Ethernet parameters.
2. Enable or disable the DHCP by clicking the check box. Enter the '**IP address**', '**IP mask**', '**Gateway**' for non DHCP. Give the unit a unique IP Address on the same IP subnet (e.g. 192.168.0.100) as the Root Bridge unit.
3. Click on the '**Apply Changes**' button to change the settings.

Home	Networking	Radio	Tools	Help	Logout																				
Summary Information :			airHaul (sB3010) - Root Bridge mode																						
<table border="1"> <thead> <tr> <th colspan="2">Wireless Configuration</th> </tr> </thead> <tbody> <tr> <td>SSID</td> <td>aH_Demo_Root</td> </tr> <tr> <td>Channel</td> <td>100 - (5500 MHz)</td> </tr> <tr> <td>RSSI (dBm)</td> <td>-6</td> </tr> <tr> <td>Maximum Wireless Throughput (Kbps)</td> <td>15360</td> </tr> </tbody> </table>			Wireless Configuration		SSID	aH_Demo_Root	Channel	100 - (5500 MHz)	RSSI (dBm)	-6	Maximum Wireless Throughput (Kbps)	15360	<table border="1"> <thead> <tr> <th colspan="2">Ethernet Configuration</th> </tr> </thead> <tbody> <tr> <td>IP Address</td> <td> 192 . 168 . 0 . 100 </td> </tr> <tr> <td>IP Mask</td> <td> 255 . 255 . 255 . 0 </td> </tr> <tr> <td>Gateway</td> <td> 192 . 168 . 0 . 1 </td> </tr> <tr> <td>DHCP</td> <td>☐</td> </tr> </tbody> </table>			Ethernet Configuration		IP Address	192 . 168 . 0 . 100	IP Mask	255 . 255 . 255 . 0	Gateway	192 . 168 . 0 . 1	DHCP	☐
Wireless Configuration																									
SSID	aH_Demo_Root																								
Channel	100 - (5500 MHz)																								
RSSI (dBm)	-6																								
Maximum Wireless Throughput (Kbps)	15360																								
Ethernet Configuration																									
IP Address	192 . 168 . 0 . 100																								
IP Mask	255 . 255 . 255 . 0																								
Gateway	192 . 168 . 0 . 1																								
DHCP	☐																								
<table border="1"> <thead> <tr> <th colspan="2">Port Information</th> </tr> </thead> <tbody> <tr> <td>ETH A MAC Address</td> <td>00:30:1A:1C:48:33</td> </tr> <tr> <td>ETH B MAC Address</td> <td>00:30:1A:1C:48:34</td> </tr> <tr> <td>Radio MAC Address</td> <td>00:30:1A:1F:4E:33</td> </tr> </tbody> </table>			Port Information		ETH A MAC Address	00:30:1A:1C:48:33	ETH B MAC Address	00:30:1A:1C:48:34	Radio MAC Address	00:30:1A:1F:4E:33	Apply Changes														
Port Information																									
ETH A MAC Address	00:30:1A:1C:48:33																								
ETH B MAC Address	00:30:1A:1C:48:34																								
Radio MAC Address	00:30:1A:1F:4E:33																								

Figure 2-20 Remote Bridge Ethernet Configuration

2.7.2 Wireless Configuration

The wireless parameters need to be configured to allow the Remote Bridge airHaul unit to associate with a Root Bridge airHaul unit.

Follow these steps below to configure the Remote Bridge Mode wireless association parameters:

1. Go the menu bar and select **Main – Remote Bridge Mode** from the **Radio** drop-down menu.
2. Enter the SSID of the Root Bridge airHaul unit.
3. Enter the radio MAC address of the Root Bridge airHaul unit.
4. Choose a radio domain from the drop down list.
5. Choose a radio channel to associate the client with the root device.
6. Select the Transmit power of the radio from Dial in Power drop down menu
7. Select the gain of the antenna from the drop down menu as per the gain of the antenna being used with the equipment.
8. Enter the RF cable loss based on the cable specifications
9. Click the **Apply Changes**. The units will attempt to associate.

Home	Networking	Radio	Tools	Help	Logout
Main - Remote Bridge					
Radio Configuration : Remote Bridge - Main				Operational mode : Remote Bridge	
<u>Wireless Settings</u>					
SSID	NEXUS_MASTER				
MAC Address	00:30:1A:1F:4A:2E				
Domain	FCC				
Channel	161 - (5805 MHz)				
Dial a Power	7 dBm	Antenna Gain (dBm):	23	RF Cable Loss(dBm) :	3
<u>Status</u>	Apply Changes				

Note: Clicking on '**Status**' will display further details on the association

Figure 2-21 Remote Bridge Wireless Settings

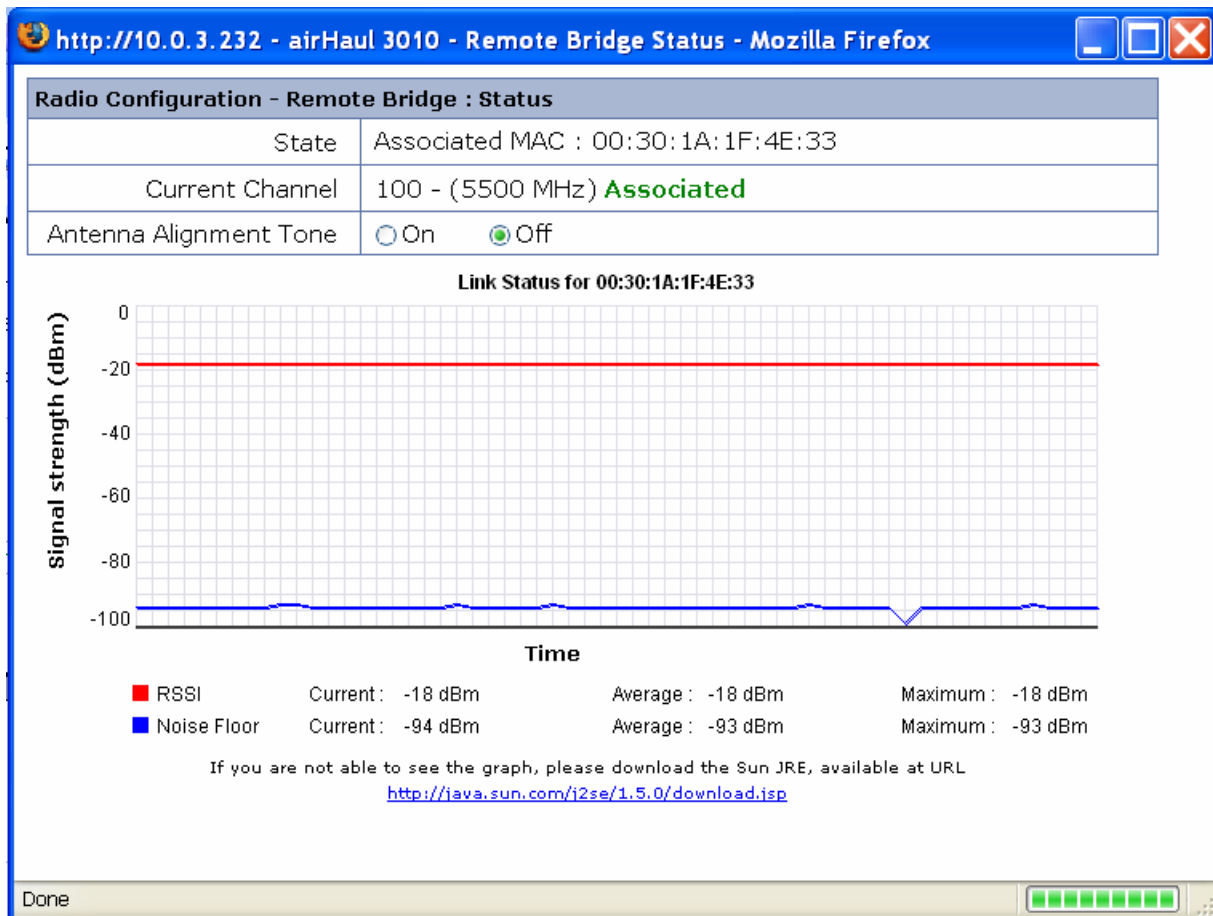


Figure 2-22 Remote Bridge Association with Root Bridge

If the association status window does not appear, click on the link to download the JRE.

Note: For Bridge and STP configuration, please refer to the section 2.6.3.

2.8. Remote Router Configuration

The airHaul units can also be configured to operate as a Remote device to associate to Root Bridge. In Remote mode, the unit can operate as a bridge or a router.

Follow the steps in section 2.7.2 to 2.7.6 to configure the device in Remote Router mode.

2.8.1 Ethernet Configuration

The Ethernet IP is configured during the operational mode change to the Remote Router mode.

Follow these steps below if you need to re-configure the Remote Router Ethernet parameters:

1. From the 'Summary Information' page, click on the '**Ethernet Configuration**' link to change Ethernet parameters.
2. Enter the 'IP address' and 'IP mask'.
3. Click on the '**Apply Changes**' button to change the settings.

Home	Networking	Radio	Tools	Help	Logout
Summary Information :			airHaul (sB3010) - Remote Router mode		
Wireless Configuration			Ethernet Configuration		
IP Address		192.168.0.206	IP Address		192 . 168 . 3 . 205
IP Mask		255.255.255.0	IP Mask		255 . 255 . 255 . 0
Gateway		0.0.0.0			
DHCP		Disabled			
SSID		NEXUS_MASTER			
Channel		161 - (5805 MHz)			
Association Status		Associated			
RSSI		-59 dBm	Port Information		
			ETH A MAC Address		00:30:1A:1C:3D:D5
			ETH B MAC Address		00:30:1A:1C:3D:D6
			Radio MAC Address		00:30:1A:1F:48:1B

Figure 2-23 Remote Router Ethernet Configurations

2.8.2 Wireless Configuration

The wireless parameters need to be configured to allow the Remote Router airHaul unit to associate with a Root Bridge airHaul unit.

Follow these steps below to configure the Remote Router Mode Wireless IP Settings parameters:

1. Click on the **'Wireless Configuration'** link from the 'Summary Information' page.
2. Enter the wireless 'IP address', 'IP Mask' and 'Gateway IP' address for the airHaul unit.
3. Check the 'Enable DHCP' checkbox to obtain an IP address automatically from network.
4. Click on the **'Apply Changes'** to change the settings.

Summary Information :

[Operational mode : Remote Router](#)

Wireless Configuration	
IP Address	192 . 168 . 0 . 206
IP Mask	255 . 255 . 255 . 0
Gateway	0 . 0 . 0 . 0
DHCP	☐
SSID	NEXUS_MASTER
Channel	161 - (5805 MHz)
Association Status	Associated
RSSI	-59 dBm

Ethernet Configuration	
IP Address	192.168.3.205
IP Mask	255.255.255.0
Port Information	
ETH A MAC Address	00:30:1A:1C:3D:A3
ETH B MAC Address	00:30:1A:1C:3D:A4
Radio MAC Address	00:30:1A:1F:49:0F

[Apply Changes](#)

Figure 2-24 Remote Router Wireless IP Configuration

In order for the Remote Router device to associate with the Root Bridge device, the user needs to configure the Root Bridge's SSID and channel information for the Remote Router device.

Follow these steps below to configure the Remote Router Mode wireless association parameters:

1. Click on 'Main – **Remote Router Mode**' from the 'Radio' drop-down menu.
2. Enter the SSID and domain of the airHaul Root Bridge device.
3. Select the Transmit power of the radio from Dial in Power drop down menu
4. Select the gain of the antenna from the drop down menu as per the gain of the antenna being used with the equipment
5. Enter the RF cable loss based on the cable specifications
6. Click **'Apply Changes'**. The units will attempt to associate.

Note: Clicking on **'Status'** will display further details on the association.

Home	Networking	Radio	Tools	Help	Logout
Main - Remote Router					
Radio Configuration : Remote Router - Main				Operational mode : Remote Router	
<u>Wireless Settings</u>					
SSID	NEXUS_MASTER Associated				
Domain	FCC				
Dial a Power	7 dBm	Antenna Gain(dBm) :	23	RF Cable Loss(dBm):	3
Channel	161 - (5805 MHz)				
Status	Apply Changes				

Figure 2-25 Remote Router Wireless Association Settings

Click on '**Status**' to view the association link-status graph.

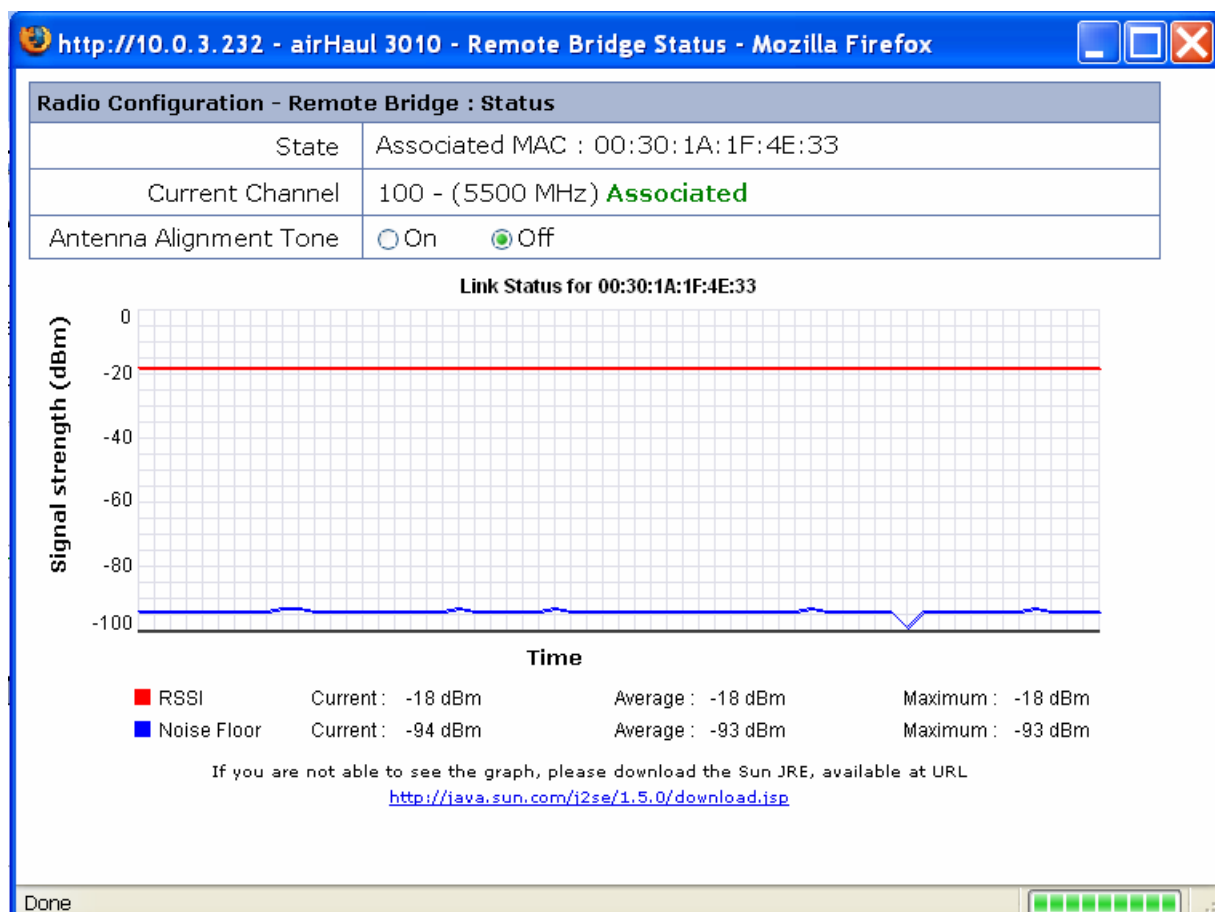


Figure 2-26 Link Status

Noise Floor is the measure of the signal created from the sum of all the noise sources and unwanted signals within a measurement system.

Note: If the association status window does not appear, click on the link to download the JRE.

2.8.3 DHCP Configurations

The Remote Router airHaul unit can be used as a DHCP server or DHCP relay agent. DHCP (Dynamic Host Configuration Protocol) allows a host to be automatically assigned a new IP address out of a pool of IP addresses for its network.

A DHCP server/relay can only be configured when the device is in the Remote Router Mode.

Follow the steps below to configure the Remote Router unit as a DHCP server:

-
1. Click on **'Networking' | 'DHCP Server'** from the menu bar to access the DHCP configuration page.
 2. Click on **'Enable DHCP'** to start the DHCP server configuration.
 3. Enter the starting IP address for the IP pool range that can be assigned to a DHCP client.
 4. Enter the Max number of users for the maximum number of clients which can be assigned an IP address at a time by the DHCP server.
 5. Enter Max Lease Time in Days, Hours and Minutes for all the clients.
 6. Enter DNS Server IP address.
 7. Click on the **'Apply Changes'** to change the settings
-

Note: The system will validate the input parameters and notify users of invalid entries.
The Starting IP address will be in the same network segment as the device wired-side Ethernet IP address.
IP address 0.0.0.0 for the DNS Server IP indicates no DNS Server to be used.
The DHCP Server is only available to hosts connected to the same LAN segment as the device wired-side Ethernet port.

Home	Networking	Radio	Tools	Help	Logout
Networking : DHCP Server Configuration			airHaul (sB3010) - Remote Router mode		
DHCP Server Configuration					
DHCP	☒ Enable DHCP Server ☐ Enable DHCP Relay ☐ Disable DHCP and DHCP Relay				
Starting IP Address	192.168.1. 0				
Max number of users	10				
Max Lease Time	Days : 0 Hours : 02 Minutes : 00				
DNS Server IP	0 . 0 . 0 . 0				
Secondary DNS Server IP	0 . 0 . 0 . 0				
Apply Changes					

Figure 2-27 DHCP Server Configurations

Follow the steps below to disable the Remote Router DHCP server:

1. Click on '**Networking**' | '**DHCP Server**' from the menu bar to access the DHCP configuration page.
2. Click on '**Disable DHCP and DHCP Relay**' to disable the DHCP server configuration.
3. Click on the '**Apply Changes**' to change the settings

Networking : DHCP Server Configuration	Operational mode : Remote Router
DHCP Server Configuration	
DHCP	☐ Enable DHCP ☐ Enable DHCP Relay ☒ Disable DHCP and DHCP Relay
Apply Changes	

Figure 2-28 Disable DHCP and DHCP Relay

2.8.4 DHCP Relay Configurations

If the user has a DHCP Server, the Remote Router airHaul device can be configured as a DHCP Relay agent of the DHCP Server for IP address assignment.

Follow the steps below to configure the Remote Router unit as a DHCP Relay Agent:

1. Click on **'Networking' | 'DHCP Server'** from the drop down menu to access the DHCP Configuration page.
2. Click on **'Enable DHCP Relay'** to choose DHCP Relay mode.
3. Enter a valid DHCP Server IP.
4. Click on the **'Apply Changes'** to start the DHCP relay agent.

Note: The system will validate the input parameters and notify users of invalid entries.
 The DHCP Server IP will be in the same network segment as the device wireless Radio IP address.
 The DHCP Server needs to be configured to serve IP range of the wired side Ethernet IP.
 The DHCP Relay Agent is only available to hosts connected to the same LAN segment as the device wired-side Ethernet port.

Networking : DHCP Server Configuration

[Operational mode : Remote Router](#)

DHCP Server Configuration				
DHCP	☐ Enable DHCP	☒ Enable DHCP Relay	☐ Disable DHCP and DHCP Relay	
DHCP Relay Agent				
DHCP Server IP	192	168	3	2

Apply Changes

Figure 2-29 DHCP Relay Agent Configurations

Follow the steps below to disable the Remote Router DHCP Relay Agent:

1. Click on **'Networking' | 'DHCP Server'** from the menu bar to access the DHCP configuration page.
2. Click on **'Disable DHCP and DHCP Relay'** to disable the DHCP server configuration.
3. Click on the **'Apply Changes'** to change the settings

2.8.5 Routing Table

The Remote Router web interface allows viewing of the routes and the addition and removal of the static routes for the Remote Router.

Follow these steps below to view the route entry in the Remote Router device.

1. Click on '**Networking**' | '**Routing Table**' from the menu bar to access the view routing table page.

Networking : Routing Table

[Operational mode : Remote Router](#)

Routing Table						
Destination	Gateway	Mask	Flags	Metric	Interface	Type
192.168.3.0	*	255.255.255.0	U	0	Wireless	D
192.168.1.0	*	255.255.255.0	U	0	Ethernet	D

Refresh

Add Static Route			
Network IP Address	. . .	Gateway	. . .
Mask	. . .	Interface	—Select— ▼
Metric		Apply Changes	

Flags : **U** - route is up

G - use gateway

A - installed by addrconf

! - reject route

Type : **D** - Dynamic Route

H - target is a host

R - reinstate route for dynamic routing

C - cache entry

S - Static Route

Figure 2-30 Routing Table

Follow these steps below to delete a static route entry in the Remote Router device.

1. Click on '**Networking**' | '**Routing Table**' from the menu bar to access the view routing table page.
2. Click on '**Del**' on the right hand side of the route entry to be deleted.
3. Click on '**Apply Changes**' to delete the route.

Note: Only static routes can be deleted.

Follow these steps below to add a static route entry in the Remote Router device.

1. Click on **'Networking' | 'Routing Table'** from the menu bar to access the view routing table page.
2. Enter the Network IP, Mask, Gateway, Interface and Metric entry for the new route.
3. Click on **'Apply Changes'** to add the new static route.

Networking : Routing Table

[Operational mode : Remote Router](#)

Routing Table						
Destination	Gateway	Mask	Flags	Metric	Interface	Type
192.168.3.1	192.168.1.10	255.255.255.255	UGH	1	Ethernet	S Del
192.168.3.0	*	255.255.255.0	U	0	Wireless	D
192.168.3.0	192.168.1.10	255.255.255.0	UG	4	Ethernet	S Del
192.168.1.0	*	255.255.255.0	U	0	Ethernet	D

Please wait while your request is in progress

[Refresh](#)

Add Static Route			
Network IP Address	192 . 168 . 3 . 0	Gateway	192 . 168 . 1 . 10
Mask	255 . 255 . 255 . 255	Interface	Ethernet ▼
Metric	12000000	Apply Changes	

Flags : **U** - route is up

G - use gateway

A - installed by addrconf

! - reject route

Type : **D** - Dynamic Route

H - target is a host

R - reinstate route for dynamic routing

C - cache entry

S - Static Route

Figure 2-31 Adding Static Route

2.9. Wireless Settings Management

Radio Configuration Main page can be accessed from the Radio menu. Its contents will be slightly different for each operating different mode.

2.9.1 Wireless Settings

Refer to the Wireless Settings for the different modes.

2.9.2 Data Encryption

Wireless Equivalent Privacy (WEP) encryption is used as security for the airHaul radio. To enable / disable WEP or change relevant settings, user can go to the encryption setting page on the web interface. The following table describes the information for the Data Encryption.

Table 2-5 Data Encryption

Page Items	Descriptions
Authentication	Select authentication method between open system and shared key <u>Open system</u>: Open System is null authentication. With WEP enabled and valid WEP key on both ends, it provides data encryption. Clients without correct WEP key still can associate but can not send packet through. <u>Shared key</u>: Strict authentication for both authentication and data encryption. Clients must provide valid WEP key to associate.
WEP	Enable /Disable WEP Encryption
WEP Key Type	HEX
WEP Key Size	Choose encryption key size between 40bits and 104bits When key size is changed, all 4 keys are lost and user needs to re-enter. <u>64 bits</u>: User has to input 10 HEX digits. <u>128 bits</u>: User has to input 26 HEX digits.
Valid Key	Choose which key in key table is used for authentication: 1 – 4 This value must be matching between the root device and the Client.
Key Table	Display / Set WEP keys A maximum of four keys can be set.

Follow the steps below to configure the Data Encryption parameters.

1. Click the '**Data Encryption**' link from the 'Radio Main' page.
2. Click the '**Enable**' button on the WEP.

3. Choose the Authentication as 'Open System' or 'Shared Key' by clicking on the radio button.
4. Choose a WEP Key Size (64 Bits or 128 Bits) from the pull-down list. WEP key length is 10 characters for 64 Bits and 26 characters for 128 Bits.
5. Choose a Valid Key from the pull-down list.
6. Enter the WEP key in the Key Table entries.
7. Click the '**Apply Changes**' button to change the settings.

Note: The system will validate the key entries and provide error or warning notifications. User must enter the key indicated by the Valid Key selection.

Data Encryption			
WEP	☐ Disable ☒ Enable		
Authentication	☐ Open System ☒ Shared Key		
Wep Key Type	HEX	Wep Key Size	128 Bits ▼
Valid Key	Second Key ▼		
Key Table			
First Key	1236789abc4501de789456f123	Second Key	1267def123345456789abc8901
Third Key	12345abcdef123456789016789	Fourth Key	12343def178456789562abc901

Apply Changes

Figure 2-32 Data Encryption Configuration

Follow the steps below to disable the Data Encryption:

1. Click the '**Data Encryption**' link from the 'Radio Main' page.
2. If it is in **Shared key** mode, please set to **Open System** before you can click Disable
3. Click the '**Disable**' button on the WEP.
4. Click the '**Apply Changes**' button to change the settings.

Data Encryption	
WEP	☒ Disable ☐ Enable

Apply Changes

Figure 2-33 Data Encryption Disable

3. Performance Parameters and Bandwidth Controller

This chapter gives instructions for editing the wireless radio protocol parameters to optimize radio performance and changing the Bandwidth Controller. These procedures are the same for all the operational modes.

3.1. Link Performance Parameters and Features

The wireless radio performance parameters can be edited to optimize the radio performance. The radio protocol parameters are:

1. Fragment Length (between 256 and 2346)
2. RTS/CTS (between 256 and 2346)
3. RSSI Threshold (between -90 and -20)
4. Preamble settings: Long, Short or Dynamic
5. Radio Operating mode
6. Throughout Optimizer

Table 3-1 Radio Performance Parameters

Page Item	Descriptions
Fragment Length	a) Show current value b) Change to a value within its range This setting determines the size at which packets are fragmented. If the frame that the access point is transmitting is larger than the threshold, it will trigger the fragmentation function. The use of fragmentation can increase the reliability of frame transmissions. Because smaller frames are being sent, collisions are much less likely to occur. Default value is 2346 bytes. The range of value is from 256 to 2346.
RTS/CTS Length	a) Show current value b) Change value RTS: <u>R</u>equ<u>e</u>st <u>T</u>o <u>S</u>end CTS: <u>C</u>lear <u>T</u>o <u>S</u>end The RTS/CTS length determines the packet size at or larger than the set value. The radio issues a request to send (RTS) before sending the packet. The primary reason for implementing RTS/CTS is to minimize collisions among hidden stations. Default value is 2346 bytes. The range of value is from 256 to 2346.
RSSI Threshold	This function provides better performance in higher noise area. The device will ignore any signal below the set RSSI threshold. The default value is -90. The value ranges from -90 to -20.
Preamble Settings	a) Show current value b) Choose other setting available in pull-down menu

Page Item	Descriptions
	The radio preamble is a section of data at the head of a packet that contains information the Root Device and Remote devices need when sending and receiving packets. The pull-down menu user to select a long, short or dynamic radio preamble. The default is dynamic. Long: a long preamble provides stable link Short: a short preamble improves throughput performance. But it only allows short preamble capable Remotes to be associated. Dynamic: a dynamic preamble allows mixing of short and long preambles
Radio Operating mode	SB Enhanced Mode gives better performance with the compression option. For this reason, it does not support 802.11b
Throughput Optimizer	The Throughput Optimizer is used to optimize the radio Link speed and performance. The Valid range is 0 to 10. The default value is 6. Setting a higher value will cause the radio to attempt to establish at the highest possible data rate in an aggressive way. A smaller "Throughput Optimizer" value means a more stable link. Note: The default value for the Throughput Optimizer is 6. Vary the Throughput Optimizer settings to achieve a more stable link.

Follow the steps below to change the Radio Performance:

1. From the **Radio Configuration** page click on the **Performance** link.
2. Enter the **Fragment Length**.
3. Input the desired **RTS/CTS Length**.
4. Choose the **Preamble Settings** from the pull-down list.
5. Choose the desired **Radio Operating mode**
6. Select an appropriate value for the **Throughput Optimizer**.
7. Click on the **Apply Changes** button to effect the changes.

Performance	
Fragment Length (256 - 2346)	2346
RTS / CTS Length (256 - 2346)	2346
RSSI Threshold	-90
Preamble Settings	Long v
Radio Operating mode	sB Enhanced Mode (Compression Off) v
Throughput Optimizer (0 - 10)	☐ 0 ☐ 2 ☐ 4 ☒ 6 ☐ 8 ☐ 10
Data Encryption	
WEP	Disabled

Figure 3-1 Performance Settings

3.2. Bandwidth Controller

Using the bandwidth controller on the root device, the user can limit the wireless link bandwidth in the egress direction. To effectively control the upload and download bandwidth, the user will need to specify the necessary bandwidth parameters on both airHaul devices.

The user can key in the maximum bandwidth of the wireless link allowed if the feeding bandwidth is adequate.

Follow the steps below to change the bandwidth parameters:

1. From the menu bar click on **Networking | Bandwidth Controller** drop down menu item.
2. Click on the **Enable** radio button.
3. Enter **Maximum Wireless Throughput**.
4. Click on the **Apply Changes** button to change the settings.

Bandwidth Controller :

[Operational mode : Root Bridge](#)

Bandwidth Controller
Bandwidth Controller : ☒ Enable ☐ Disable
Maximum Wireless Throughput (Kbps) 2000
Apply Changes

Figure 3-2 Bandwidth Controller

4. Site Survey

The **Site Survey** tool is available for airHaul units operating in Remote mode.

To access the site survey page, go to '**Tools**' | '**Site Survey**' drop down menu. The following figure shows the list of SSID from the site survey. It helps to select the root device with which the remote can associate. In order to associate with any of the device in the list, click on the corresponding radio button and press the '**Associate**' button.

BSS List					
rows indicate airHaul root devices					
Sr.no	MAC Address	Channel/Freq	RSSI(dBm)	SSID	
1	00:30:1A:1F:4D:F4	7 - (2442 MHz)	-83	aC_Demo	☒
2	00:30:1A:1F:49:B8	11 - (2462 MHz)	-88	aC_AP	☐
3	00:30:1A:1F:53:8A	6 - (2437 MHz)	-60	NEXUS_AP_SN	☐
4	00:30:1A:1F:49:6E	124 - (5620 MHz)	-69	sB_Internet	☐

Associate

Current Configuration	
SSID	NEXUS_MASTER

Refresh

(Data will refresh automatically after every 30 seconds)

Figure 4-1 Site Survey showing associated devices

5. Antenna Alignment

Antenna Alignment can be used to optimize the radio performance and check the RSSI. This is only available when it is in Remote device mode. To access the antenna alignment, go to the menu bar under **Tools** and choose '**Antenna Alignment**' menu item. In order to view this information (Link Status), from the Radio page, use the Wireless Settings to associate the Remote (Router or Bridge mode) with a Root device.

Click on the '**Status**' link to go to the Antenna Alignment page. The Link Status page will be displayed as below.

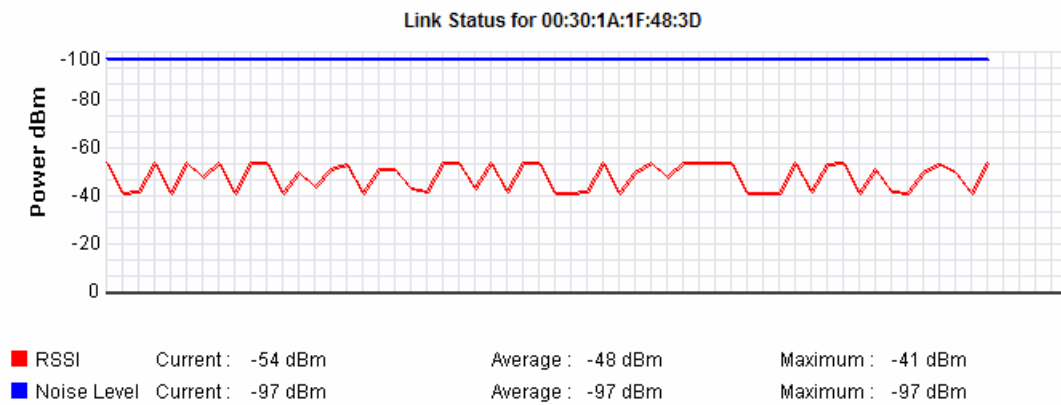
RSSI Audio Tones are provided to help the user to align the antenna without looking at the link status display. Click on the 'Antenna Alignment Tone On' button to hear the alignment tones. You will need to insert the earphones provided into the earphone jack in the unit. For more information on antenna alignment, please refer to the Quick Installation Guide.

To perform the antenna alignment:

-
1. Go to the menu bar and choose '**Radio**' menu item.
 2. From the Radio page, use the Wireless Settings to associate to the Root device
 3. Click on the 'Status' link to go to the Antenna Alignment page. The Link Status page will be displayed as below. In the case of Root Bridge, click '**View Association Table**' to view the associated client and check the same.
 4. Insert the earphones into the audio jack.
 5. A set of tones are provided to help the user align the antenna without looking at the link status display. Click on the '**Antenna Alignment Tone**' to ON button to hear the alignment tones.
-

Note: Different pitch levels indicate a different RSSI value. The higher the pitch the better the RSSI value.

Radio Configuration - Remote Client Router : Status		
State	Associated MAC : 00:30:1A:1F:48:3D	
Current Channel	36 - (5180 MHz)	Associated
Antenna Alignment Tone	☐ On ☒ Off	



If you are not able to see the graph, please download the Sun JRE, available at URL
<http://java.sun.com/j2se/1.5.0/download.jsp>

Figure 5-1 Antenna Alignment

6. Traffic Statistics

Wireless and Ethernet Traffic Statistics can be displayed by clicking on the 'Networking' | 'Statistics' drop down menu. The following figure shows the statistics page. This page will be refreshed after every 10 seconds.

Networking : Traffic Statistics

[Operational mode : Remote Router](#)

Wireless Traffic Statistics	
Transmitted :	
Transmit Success Rate	294
Transmitted Multiple retry Count	36
Transmit Retry Rate	22
Transmitted Failure Count	211
Received :	
Receive Success Rate	10512
Receive Duplicate Rate	54
Received Frame Count	10887
Received Frame FCS Error Count	42
Ack Receive Failure Count	256
RTS Fail	0
RTS Success	0
Aborted :	
No of Aborted Frames	1
No of PHY Aborted Frames	139

Ethernet Traffic Statistics		
Transmitted :	ETH A	ETH B
Transmitted Bytes	6876529	79289
Transmitted Unicast Packets	36230	885
Transmitted Discards	0	0
Transmitted Errors	0	0
Received :		
Received Bytes	8782817	0
Received Unicast Packets	91656	0
Received Multicast Packets	11	0
Received Discards	0	0
Received Errors	0	0

[Refresh](#)
 (Data will refresh automatically after every 60 seconds)

Figure 6-1 Traffic Statistics

Table 6-1 Ethernet Traffic Statistics

Ethernet Traffic Statistics	
Transmitted Bytes	Total No of packets transmitted from the particular interface
Transmitted Unicast packets	Total number of packets transmitted to a specified destination
Transmitted Discards	No of packets dropped because of congestion or an error along the path In most cases, packet loss is due to network congestion. Packets are discarded to avoid the very large delays that can arise when too much traffic is queued up.
Transmitted error	No of packets discarded because of format error
Received Bytes	Total No of packets received through the particular interface
Received Unicast packets	Total No of packets received with a specified destination.

Ethernet Traffic Statistics	
Received Multicast Packets	Total No of packets received with a specified destination.
Received Discards	No of packets discarded due to resource limitation
Received Errors	No of packets discarded because of form at error

Table 6-2 Wireless Traffic Statistics

Wireless Traffic Statistics	
Transmit Success Rate	No of successfully transmitted unicast and multicast MPDU's.
Transmit Multiple retry	No of unicast MPDU's successfully transmitted after two or more retries.
Transmit Retry rate	No of unicast MPDU's successfully transmitted after one retry.
Transmitted Failure count	No of unicast MPDU's for which the maximum number of retries were exceeded.
Received Success Rate	No of successfully received unicast MPDU's
Received Duplicate Rate	No of successfully received unicast MPDU's that were a duplicate of earlier frames.
Received Frame FCS Error Count	No of unsuccessfully received frames
ACK Receives Failure Count	No of frame transmissions for which an acknowledgement response frame was expected but not received.
RTS Fail	No of transmitted RTS frames for which no response CTS frame was received.
No of Aborted Frames	No of frames that are aborted by the radio. An aborted frame occurs when it experiences a brief or permanent internal error that interrupts the transmission of the frame.
No of PHY Aborted Frames	No of PHY aborted frames when Imac drops frames. This can happen only when PLCP checksum failure occurs.

Note: The wireless statistics is also accessible from the 'Radio Configuration' bottom page.

7. Tools

The System Configuration such as modifying the SNMP security settings and resetting the unit are given here. You will also learn how to save the configuration parameters as profiles and using the Link Budget Planning Tool.

7.1. System Configuration

The System Configuration page provides a one page tool to configure the airHaul device. To access the System Configuration page go to 'Tools' | 'System Configuration' drop down menu. The following figure displays the System Configuration page.

Home	Networking	Radio	Tools	Help	Logout
System Configuration :			airHaul (sB3010) - Root Bridge mode		
System Configuration					
System Name	Nexus				
System Description	Nexus				
SNMP Security	SNMP Security				
Reset	Reset				
Delayed Reset	Delayed Reset				
NTP Server	NTP Server Settings Time Server Not available				
Firmware Version	v1.00.10 Release Notes				
Radio Firmware Version	1.1.2.17				
Edit Configuration	IP Configuration Radio : Performance Data Encryption				
Reset To Factory Defaults	Reset To Defaults				
Ethernet MTU Size	1512 bytes				
Syslog server IP Address	0.0.0.0				Log level : -
SNMP Trap server IP Address	0.0.0.0				
Watch Guard	Suspended	for 5699 seconds	Enable	Suspend	
LED Control	On				
Current Operational Mode					
Root Device		Remote Device			
☒ Bridge		☐ Bridge			
		☐ Router			

Figure 7-1 System Configuration

The following page summarizes the page contents of the System Configuration page.

Table 7-1 System Configuration

Page Item	Descriptions
System Name	Displays name of airHaul unit Allows user to change airHaul unit name
System Description	Displays description of airHaul unit Allows user to change airHaul unit description
SNMP Security	Access the SNMP security settings
Reset	Reset device
Delayed Reset	Schedule a reset
NTP Server	NTP server setup, as well as NTP time if server is setup
Software Version	Display the installed firmware version
Radio Firmware Version	Display the installed radio firmware version
Edit Configuration	Provide links to edit IP, radio, configurations
Reset To Factory Defaults	Resets the device to factory default settings
Ethernet MTU Size	Set the Ethernet MTU Size
Syslog server IP Address	Display the current message syslog server IP Address. User can change the IP address.
SNMP Trap IP	Display the current SNMP trap IP address. User can change the IP address.
Log Level	Display the current Log Level
Watch Guard	Suspends/Enables the radio defenders. If the Watch Guard is Suspended the defenders will stop for 2 hours and start again thereafter. If the Watch Guard is enabled the radio defender's will start immediately. Note: The Radio Defenders will monitor the Wireless Association Status (automatically) and traffic and take corrective action if needed.
LED Control	Display the current led on status. User can change the LED status to on/off
Current Operational mode	Display the current operational mode. User can change the current operational mode.

7.1.1 SNMP Security

The user can edit the SNMP Community String and SNMP Access filters. The SNMP community needs to match with the SNMP monitoring software used. The SNMP Access Filters allows you to determine which host(s) is authorized to monitor the device using SNMP. It is recommended that you set this for security reason and prevent an attack. To change the SNMP security settings, click on the SNMP security link in the System Configuration page. Figure 6-2 shows the SNMP Security Configuration page.

Follow the steps below to change the SNMP security settings.

1. Enter New Community and Confirm Community with the same string.
2. Check the 'SNMP Access Filters' Enable box.
3. Enter Access Filters IP Address and Mask up to three IP's settings can be entered.
4. Click the 'Apply Changes' button.

System Configuration : SNMP Security

[Operational mode : Remote Router](#)

SNMP Security

SNMP Community :

New Community :

Confirm Community :

SNMP Access Filters ☐ Enable

1) IP : . . .
Mask : . . .

2) IP : . . .
Mask : . . .

3) IP : . . .
Mask : . . .

Figure 7-2 SNMP Security Configuration

Table 7-2 Description of SNMP Page Items

Page Items	Descriptions
SNMP Community	Display SNMP Community String that is currently used to communicate to the device through SNMP
New Community	User can change the SNMP Community String by entering a new Community string
Confirm Community	User must enter the same community string as New Community string to confirm.
Access Filters	Display the Current Access Filter status User can change the Access Filter status.
IP	List of 3 IP filters. User can enter the IP address and mask. Only the specified host can have SNMP access to the airHaul.

7.1.2 Reset Options

All reset options power cycles the device and restarts the whole system.

Reset: To reset the device. The device will reboot with the current configuration/values.

Reset to Defaults: To reset the device to factory default configuration values.

Delayed Reset: To reset the device at a particular time and can be programmed to do so on a daily/weekly/monthly basis. The current time can be set by specifying a NTP server (there is one already specified by default) and the time zone. After enabling the delayed reset, specify a time which is valid in reference to current time. When recurrence is set to weekly, monthly or daily, the reference is made with the first set time i.e. Reset time.

Tools : Delayed Reset

[Operational mode : Remote Router](#)

Delayed Reset	
☐ Disable Delayed reset	
Reset time : 23-01-2005	Hour : 2 : Minutes : 15
Recurrence : ☐ Daily ☐ Weekly ☐ Monthly ☒ Only once	
Apply Changes	

NTP Server Settings	
IP address of the NTP server	128.250.36.2
Time Zone	(GMT+08:00)Kuala Lumpur,Singapore
Current Time	Time Server Not available

Figure 7-3 Delayed Reset Settings

For delayed reset, follow the steps below:

1. Select date from the calendar that has been provided.
2. Select the recurrence.
3. Click 'Apply Changes' button to change the settings.
4. To disable 'Delayed Reset', check the relevant box.

7.1.3 NTP Time Server Setup

The device time comes from the network time information source. The device needs access to a network timer (NTP time server) source. The NTP time server IP can be configured as follows:

1. From the 'System Configuration' page, click on the '**NTP Server Setting**' link.
2. A 'Time Settings' page will be displayed. Click on the '**NTP Server Settings**' link to enable timer settings input.
3. Enter a valid NTP server IP address and select the Time Zone. The default NTP server is 128.250.36.2 and the default Time Zone is Singapore.
4. Click on the '**Apply Changes**' button to configure the NTP.
5. The network time will appear on the browser if NTP server is contactable.

Note: Please ensure the NTP server IP is reachable from the device. Use the ping test tool from the 'Tools | Link Test' to check if the NTP server can be pinged from the device. The device can still operate without the Time Server configuration, however you will not be able to perform Delayed Reset function.

NTP Server Settings	
IP address of the NTP server	128 . 250 . 36 . 2
Time Zone	(GMT+08:00)Kuala Lumpur,Singapore v
Current Time	Time Server Not available
Apply Changes	

Figure 7-4 NTP Time Settings

7.2. Profile Manager

The airHaul Nexus configuration parameters can be saved as profiles in the system. There are four profiles available in the system:

1. Installation profile
2. Profile1
3. Profile1
4. Profile3

All the four profiles contain the same default parameters from factory settings. User can save the current configuration to any of the four profiles, and re-load the profiles later on. User can also create different configurations and save them as different profiles. The different profiles can also be loaded at different based on a pre-defined calendar schedule.

The Profile Manager configuration page can be accessed from the navigation menu bar Tools | Profile Manager drop down menu. The following figure displays the Profile Manager page.

Tools : Profile Manager

[Operational mode : Remote Router](#)

Save Profile	
Save As: Installation Profile	Profile Description : Easy Link Installation
Save Profile	

Operating Profile :	
Last loaded Profile : None	Description : None
Change Profile to : Installation profile	Description : Easy Link Installation
Load Profile	

Profile Calendar :	
Select Profile : --Select--	Time Server Not available
Apply Changes	

Figure 7-5 Profile Manager

Table 7-3 Function Descriptions

Page Item	Descriptions
Save As:	Select which profile name to save for the current configuration
Profile Description:	Specify a description for the profile to be saved.
Save Profile button	Click to save current profile
Change Profile To:	Select which profile to load as current configuration
Profile Description:	Description for profile to be loaded.
Load Profile button	Click to Load a specified profile
Select Profile:	Choose a profile to schedule

7.2.1 Save Profile

Follow the steps below to save the current configuration to a profile:

-
1. Select a profile name from 'Save As':
 2. Enter a description of the profile.
 3. Click the '**Save Profile**' button to apply changes.
-

Note: Existing configuration parameters in the selected profile name will be replaced with current configuration parameters.

7.2.2 Load Operating Profile

-
1. Select a profile to load from the Change Profile to:
 2. Click the **Load Profile** button to load the specific profile.
-

Note: Current configuration parameters will be replaced by the new loaded profile. User will be asked to wait while the new profile loads.

7.2.3 Profile calendar

Profile calendar allows user to manage profiles based on different calendar times. User can configure different profiles and scheduled activities based on the different profiles at a pre-defined time.

A typical situation is an operator has two profiles, to be switched on alternatively during the day and during the night time. User creates the two different profiles and save them as ProfileDay and ProfileNite and use the Profile Calendar to schedule the activation of the two profiles.

Follow the steps below to schedule the activation of a saved profile:

-
1. Select a profile to schedule.
 2. Uncheck the '**Disable Profile Calendar**' check box. A profile calendar will be displayed
 3. Select date, time from the load time calendar. Use the calendar icon to choose a start date.
 4. Select the recurrence (daily, weekly, monthly, only once).
 5. Click the '**Apply Changes**' button. The schedule will be loaded either daily, weekly monthly or only once at the specified start date and time.
 6. To disable the scheduled profile, check the check box '**Disable Profile Calendar**'.
-

Profile Calendar :			
Select Profile : Profile 1		☐ Disable Profile Calendar - Profile 1	
(dd-mm-yyyy)		Hour	Minutes
Load time :	10-11-2004	8	: 00
Recurrence :	☒ Daily	☐ Weekly	☐ Monthly
	☐ Only once		
Apply Changes			

Figure 7-6 Scheduling a Profile

7.3. Link Test

Link Test utility is available from the navigation menu bar Tools | **Link Test** drop down menu. From Link Test tools, the user can test Throughput and perform Ping Test. User needs to run Radio Transmit on one radio and Radio Receive on the other to run the Throughput test.

User has to specify the IP address for the test.

Follow the steps below to do a Ping Test:

1. Enter a valid IP address for Far-end Radio IP Address.
2. Click on the '**Start**' button under 'Ping'. The Ping result will be displayed.
3. Click the '**Stop**' button to stop the test.

Tools : Link Test

[Operational mode : Root Bridge](#)

Far-end Radio IP Address

192 . 168 . 3 . 5

Ping Test	Throughput Test
Start Stop	Radio Transmit Radio Receive Stop

Showing Ping Request

```

Packet 9: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 10: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 11: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 12: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 13: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 14: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 15: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 16: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 17: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
Packet 18: 64 bytes from 192.168.3.5: icmp_seq=0 ttl=
  
```

Figure 7-7 Ping Test Result

The Link Test page for Remote Devices shows the SSID of the Remote Device, Association status and the channel.

The following page shows the Link Test for the Remote Devices:

Home	Networking	Radio	Tools	Help	Logout
Tools : Link Test			Operational mode : Remote Router		
SSID : MASTER_YS Association Status : Associated			Channel : 161 - (5805 MHz) RSSI (dBm): -55		
Far-end Radio IP Address			192 . 168 . 3 . 216		
Ping Test Start Stop			Throughput Test Radio Transmit Radio Receive Stop		
Showing Ping Request Packet 1: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 2: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 3: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 4: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 5: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 6: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 7: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 8: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 9: 64 bytes from 192.168.1.216: icmp_seq=0 Packet 10: 64 bytes from 192.168.1.216: icmp_seq=0					

Figure 7-8 Link Test Result

7.3.1 Throughput Test

Follow the steps below to do a Throughput Test:

1. Set up a link between two airHaul units (one in Root Bridge mode and another in Remote Bridge or Router mode).
2. Enter a valid IP address of the far-end Radio.
3. Click on the '**Radio Receive**' or '**Radio Transmit**' button.
4. The Throughput test will start and the result will be displayed.
5. Click the '**Stop**' button to stop the test.

Tools : Link Test

[Operational mode : Root Bridge](#)

Far-end Radio IP Address

192 . 168 . 1 . 3

Ping Test

Start

Stop

Throughput Test

Radio Transmit

Radio Receive

Stop

Throughput Test - Transmit

```
[ 9] 0.0-30.0 sec 43.2 MBytes 12.1 Mbits/sec
[ 9] 30.0-60.0 sec 44.2 MBytes 12.4 Mbits/sec
[ 9] 60.0-90.0 sec 46.1 MBytes 12.9 Mbits/sec
[ 9] 90.0-120.0 sec 45.2 MBytes 12.6 Mbits/sec
[ 9] 120.0-150.0 sec 39.2 MBytes 11.0 Mbits/sec
[ 9] 150.0-180.0 sec 45.1 MBytes 12.6 Mbits/sec
[ 9] 180.0-210.0 sec 46.6 MBytes 13.0 Mbits/sec
```

Figure 7-9 Throughput Test Result

The Following Page shows the Throughput Test for the Remote Devices:

Home	Networking	Radio	Tools	Help	Logout
Tools : Link Test			Operational mode : Remote Router		
SSID : MASTER_YS Association Status : Associated			Channel : 161 - (5805 MHz) RSSI (dBm): -56		
Far-end Radio IP Address			192 . 168 . 3 . 216		
Ping Test Start Stop			Throughput Test Radio Transmit Radio Receive Stop		
			Throughput Test - Transmit Test 1 :Successfully uploading @564.0 Kbits/sec Test 2 :Successfully uploading @498.0 Kbits/sec Test 3 :Successfully uploading @511.0 Kbits/sec Test 4 :Successfully uploading @485.0 Kbits/sec Test 5 :Successfully uploading @511.0 Kbits/sec		

Figure 7-10 Throughput Test Result

7.4. Link Budget Planning

Link Budget Planning is a very useful tool for link budget estimation. The Link Budget Planning Calculator can be accessed from the navigation menu bar 'Tools| Link Budget Planning Calculator' drop down menu.

A GPS Calculator is provided in the Link Budget Planning Calculator page to calculate the distance between two airHaul stations. To calculate the distance, follow the steps below:

1. Enter the GPS co-ordinates of Station 1 (Latitude 1 and Longitude1) and Station 2 (Latitude 2 and Longitude 2). GPS co-ordinates may be entered in DD: MM:MM or DD: MM: SS.SS formats.
2. Select the distance units (miles or kilometers).
3. Click the '**Compute Distance**' button.
4. The distance between the two stations will be displayed in the Distance box as in Figure 7-9.

GPS Calculator					
Latitude1		Longitude1		Latitude2	
00:03.00	N	00:00.00	W	00:00.05	N
				00:00.00	W
					Compute Distance
Course 1-2 (Degrees)		Course 2-1 (Degrees)		Distance	
180		0		3 miles	

Figure 7-11 Link Budget Planning Calculator GPS Calculator

Once the distance is computed, user can do the link budget calculations as follows:

1. Select the radio mode for station 1 and 2.
2. Enter the transmit output power in dBm for station 1 and 2.
3. Enter the antenna Gain in dB for station 1 and 2.
4. Enter the Cable Losses in dB for station 1 and 2.
5. Click the '**Compute Link Budget**' button to calculate the link budget information.
6. The link budget information will be displayed as in Figure 7-10.

The link budget information EIRP, Free Space Loss and Theoretical RSSI are computed and displayed.

The Receive Sensitivity, Maximum Transmit Power, System Gain and Available Fade Margin at various Link Speeds are also computed and displayed in a table.

Ideal fade margin for a link is between 10 dB to 20 dB for a stable link base on the environmental condition of a region.

Fresnel Zone Clearance Required will also be displayed.

Distance from Station1 to Station2 is miles (Please Select)

Station1		Station2	
Device :	airHaul Nexus v	Device :	airHaul Nexus v
Radio Mode:	High Band v	Radio Mode:	High Band v
Tx Output Power (dBm) :	23 (-4 to 23)	Tx Output Power (dBm) :	23 (-4 to 23)
Antenna Gain :	18 v	Antenna Gain :	18 v
Cable Loss :	2.0	Cable Loss :	2.0
		Compute Link Budget	
EIRP :	39	EIRP :	39
Free Space Loss :	120.4	Free Space Loss :	120.4
Theoretical RSSI Approximately (dBm) :	-65	Theoretical RSSI Approximately (dBm) :	-65 (Recommended minimum -75dBm)
Available Fade Margin @54 mbps (dBm) :	6	Available Fade Margin @54 mbps (dBm) :	6
Available Fade Margin @6 mbps (dBm) :	27	Available Fade Margin @6 mbps (dBm) :	27
Fresnel Zone Clearance Required : 5 meters			
Clear			

Figure 7-12 Link Budget Planning Calculator Link Budget

8. Firmware Upgrade

The latest firmware for airHaul Nexus is available for download from smartBridges Support web-site at http://www.smartbridges.com/support/ah_nexus.asp.

The airHaul Nexus device firmware can be upgraded from the web management interface.

Follow the steps below to upgrade the airHaul Nexus firmware:

1. Download the latest (or a particular release version) of the airHaul Nexus firmware from the web-site http://www.smartbridges.com/support/ah_nexus.asp to your local PC.
2. Login to the device web interface. Go to **Tools | Firmware Upgrade** drop down menu. The Firmware Upgrade page will be displayed as shown below.
3. Enter the firmware tar-ball file name downloaded in Step 1.
4. Click on the **Upgrade** button to upgrade the firmware.
5. When the firmware tar-ball file transfer is completed, a message will be displayed on the web-page.
6. Wait about **10** minutes for the device firmware to be upgraded. Once the upgrade completes, a pop-up window displaying the upgraded firmware version will appear.

Note: During the upgrade period (about 10-15 minutes), the airHaul unit must NOT be reset or power-cycled.

Home	Networking	Radio	Tools	Help	Logout
Tools : Firmware Upgrade			airHaul (sB3010) - Root Bridge mode		
Firmware Upgrade					
Current Firmware Version		v1.00.10			
Upgrade System Software Tar File		C:\SB3210_IXP_v1.00.10.tar Browse...			
					Upgrade

Figure 8-1 airHaul Nexus Firmware Upgrade page

Tools : Firmware Upgrade

System Software Tar File has been transferred.
The device is being upgraded and will be unavailable for 10-15 minutes.

DO NOT Reset or Reboot during this time.....

Time elapsed : 00:28 (MM:SS)

Figure 8-2 airHaul Nexus Firmware Upgrade (Firmware transferred)



Figure 8-3 Successful upgrade pop-up window

Appendix A – Points to Remember

Antenna

Frequency support

- 5GHz antennas will work between 5.2 and 5.8 GHz.
- 2.4 GHz band antennas will work between 2.4 GHz to 2.485 GHz

Gain

- 5 Ghz band antenna gain is 23 dBi.
- 2.4 Ghz band antenna gain is 24 dBi
- 29 dBi gain antenna is also available in request

Beamwidth

- -3 dB Beam Width 10° -5GHz band antenna
- -3 dB Beam Width 8° - 2.4 GHZ band antenna

Polarization:

- Polarization -Linear Horizontal or Vertical
- Factory assembled sB antennas are vertically polarized.
- Polarity can be changed from vertical to a horizontal polarity by rotating the dish.

Mode of Operations

Different Modes of Operation

- Root Device
 - Root Bridge Mode.
- Remote Device
 - Remote Bridge Mode
 - Remote Router Mode

Bridge mode

- Device will act as a transparent bridge and will operate in Mac layer.
- Bridge mode association is based on channel and MAC authorization only. ESSID will not be used for the setting up a link.
- If the remote client is configured in a bridge mode and channel needs to be changed then channel needs to be changed at both the radios.

Router mode

- Device will operate in layer 3 to perform routing. It is pure routing and network provider has to take care of proper routing as there is no NAT feature in airHaul.
- In a Router mode, the association is based on SSID.
- Remote device configured in a Router mode will automatically follow the Root Bridge for any change in channel. For this reason, the Remote Router mode is preferred. Please select a channel with low interference for setting up a link in the beginning.

Radio

- Transmit power – can be varied between -5 dBm to +23 dBm
- To achieve high distance and high throughput at low EIRP (33dBm as per ETSI) a high gain antenna (29 dBi) with low transmit power of the radio is recommended.
- Setting up a radio at high Transmit power may result into Amplifier saturation, radio tends to distort EVM. So we suggest that you try to use lower than the maximum power level.
- Maximum recommended Transmit power in 5GHz band is 18dBm and in 2.4 GHz band it is 20 dBm

- Transmit power and RSSI are important criteria for getting a stable link

Throughput Optimizer

- The default value for the Throughput Optimizer is 6
- Throughput Optimizer settings is used to optimize the wireless link throughput
- Smaller "Throughput Optimizer" value means more stable link

Performance

The primary reason for implementing RTS/CTS is to minimize collisions and retransmission in a highly overcrowded.

Fragmentation

- Fragmentation can be used to avoid retransmission of the packets.
- The fragment size value can typically be set between 256 and 2,048 bytes.
- Fragmentation can improve throughput if the fragmentation threshold is set just right value.

Range

- Maximum range of sB3010 is 20 Miles
- 6 Miles can easily achieved with 23 dBi antenna
- More than 6 miles can be achieved by using high gain antennas.

RSSI

- Recommended RSSI value of -75 dB or better for optimal performance.

Profile manager

- With Profile manager one can save/load multiple Operating profiles on the device.
- The Profile Calendar will automatically activate them at defined times.
- Optimal bandwidth utilization of the bandwidth on the basis of various time intervals as per the traffic pattern of the customer can be achieved through pre-scheduling of profiles

Bandwidth Controller

- Bandwidth Controller will define the Maximum upload Wireless Throughput (Kbps) for a radio.
- Maximum bandwidth capping for sB3010 is 15 Mbps

Link Test

- Web based ping test and throughput test option is available for testing a link.

Association of Radio

- In the 5 GHz band, due to DFS requirements (avoidance of interfering with Military Radar), there might be a time delay in association of a radio. Usually it will associate within 1 minute.
- For few channels the radios is required to sense the channel for a full one minute before it will even send out a beacon for setting up a link

Firmware upgrade

- A Web based firmware upgrade option
- It will automatically retain the same configuration parameters which were configured before the upgrading.

Multiple watchdog timer

For cases when the device is stuck in an invalid state during firmware upgrade, the hardware watchdog timer detects the situation and will restart the equipment.

Appendix B – Useful terms and definitions

Acronyms and Abbreviations	
MAC	Media Access Control
RSSI	Receive Signal Sensitivity Indication
SSID	Service Set Identifier
DHCP	Dynamic Host Configuration Protocol
ACL	Access Control List
SNMP	Simple Network Management Protocol
NTP	Network Time Protocol
STP	Spanning Tree Protocol
TCP	Transmission Control Protocol
IP	Internet Protocol

802.11h

The 802.11h specification is an addition to the 802.11 family of standards for wireless local area networks (WLANs). 802.11h is intended to resolve interference issues introduced by the use of 802.11a in some locations, particularly with military radar systems and medical devices.

802.11Q

IEEE **802.11Q** defines a mechanism for tagging frames so that they can be segregated into separate **VLANs**.

802.11i

An upcoming security standard currently being developed by IEEE that features 802.1x authentication protections and adds AES (Advanced Encryption Standard) technology, a stronger level of security than used in WPA for encryption protection along with other enhancements.

IEEE 802.1x

A security standard featuring a port-based authentication framework and dynamic distribution of session keys for WPA-TKIP encryption. A RADIUS server is required.

SSID

Each **ESS** has a Service Set Identifier (**SSID**) used to identify the **Radio** that belong to the **ESS**. **Radios** can be configured with the **SSID** of the **ESS** to which they should associate. By default, radios broadcast their **SSID** to advertise their presence.

VLAN

A **VLAN** is a switched network that is logically rather than physically segmented. **VLANs** enable workstations and other devices to have a virtual association - independent of geographic location or physical attachment to the network. These groupings can be based upon organizational unit, application, role, or any other logical grouping.

WEP

According to the IEEE 802.11 standard, **Wired Equivalent Privacy (WEP)** is intended to provide “confidentiality that is subjectively equivalent to the confidentiality of a wired local area network medium and that does not employ cryptographic techniques to enhance privacy.”

WEP relies on a secret key that is shared between a mobile station and an access point. **WEP** uses the RC4 stream cipher invented by RSA Data Security. RC4 is a symmetric stream cipher that uses the same variable length key for encryption and decryption. With WEP enabled, the sender encrypts the data frame payload and replaces the original payload with the encrypted payload. The sender then forwards the encrypted frame to its destination. The encrypted data frames are sent with the MAC header **WEP** bit set. Thus, the receiver knows to use the shared **WEP** key to decrypt the payload and recover the original frame. The new frame, with an unencrypted payload can then be passed to an upper layer protocol.

WEP keys can be either statically configured or dynamically generated. In either case, **WEP** has been found to be easily broken.

WPA

Wi-Fi Protected Access (**WPA**) is a replacement security standard for **WEP**. It is a subset of the IEEE 802.11i standard being developed. **WPA** makes use of **TKIP** to deliver security superior to WEP. 802.1X access control is still employed. The **Authentication Server** provides the mechanism for creating the keys.

Packet Concatenation

Packet concatenation will increase the throughput of the equipment by simply buffering the packets at the transmitter and convert them into superframe for the transmission over the wireless interface.

Packet Bursting

Packet bursting is for increasing the throughput by increasing the window size and reducing the time for acknowledgement.

Packet Compression

LZO compression is being used to achieve more throughputs.

COFDM

COFDM involves modulating the data onto a large number of carriers using the FDM technique. The Key features which makes it work, in a manner is so well suited to terrestrial channels, includes:

- Orthogonality (the “O” of COFDM);
- The addition of Guard interval;
- The use of error coding (the “C” of COFDM), interleaving and channel-state information

COFDM is resistant to multipath effects because it uses multiple carriers to transmit the same signal.

Spanning Tree Protocol (STP)

STP is a Layer 2 link management protocol that provides path redundancy while preventing loops in the network. For a Layer 2 Ethernet network to function properly, only one active path can exist between any two redundant links. Spanning-tree operation is transparent to end stations, which cannot detect whether they are connected to a single LAN segment or to a LAN of multiple segments.

RIP

The most popular of the TCP/IP interior routing protocols is the *Routing Information Protocol (RIP)*. RIP is used to dynamically exchange routing information. RIP routers broadcast their routing tables every 30 seconds by default. Other RIP equipments will listen for these RIP broadcasts and update their own route tables.

DHCP

DHCP stands for 'Dynamic Host Configuration Protocol' and is a means for networked computers to get their TCP/IP networking settings from a central server. Importantly, DHCP assigns IP addresses and other TCP/IP configuration parameters automatically.

SNMP

Short for ***Simple Network Management Protocol***, a set of protocols for managing complex networks. The first versions of SNMP were developed in the early 80s. SNMP works by sending messages, called *protocol data units (PDUs)*, to different parts of a network. SNMP-compliant devices, called *agents*, store data about themselves in *Management Information Bases (MIB)* and return this data to the SNMP requesters.

SYSLOG

In order to track information on events, device jobs, and packets flows, most security devices output these events using the syslog information model. This output uses a specific format and protocol defined in RFC 3164.

Appendix C – Sample airHaul Bridge to Router Setup

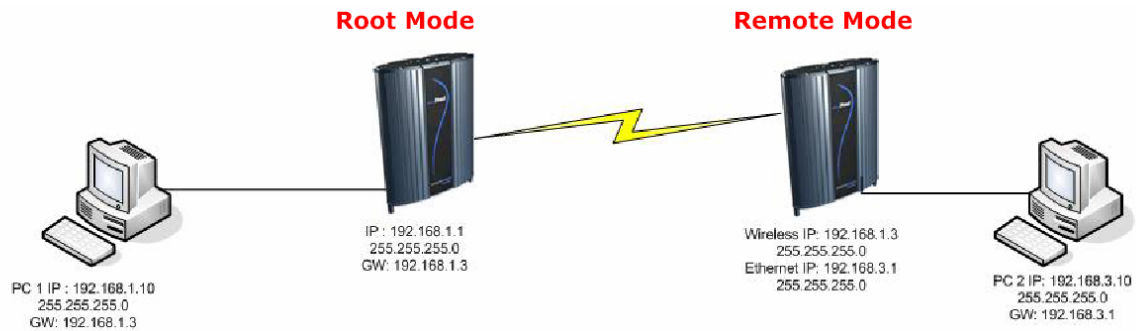


Figure 58 Sample airHaul Point to Point Setup (Root Bridge to Remote Router)

The above figure shows a sample Nexus link setup. One airHaul unit is configured as 'Root Bridge' device with one IP address assigned. A client PC (PC1) connected on the Ethernet interface of the Root Bridge device would need to be in the 192.168.1.x subnet (in this example the IP is 192.168.1.10) with the gateway IP set to 192.168.1.3 (the Remote's wireless interface IP address).

The Remote device operates in Remote Router mode. It requires IP address to be assigned for each interface – Ethernet and Wireless. For the wireless interface the IP address would be 192.168.1.x (in this example 192.168.1.3) and the Ethernet interface on separate IP network e.g. 192.168.3.1. The PC2 NIC will need to be same subnet as the Ethernet interface e.g. 192.168.3.10 and have the gateway set to 192.168.3.1 (IP address of airHaul's Ethernet Interface).

Appendix D – SNMP Trap

The airHaul Nexus generates SNMP trap that can be forwarded to the SNMP Trap server. The SNMP Trap server IP address is set in section.

The following table provides a list of SNMP traps generated.

Trap	Message
IP address	Object Identifier: 1.3.6.1.4.1.14882.2.1.1 Value: <changed IP address>
IP netmask	Object Identifier: 1.3.6.1.4.1.14882.2.1.2 Value: <changed IP netmask>
Gateway	Object Identifier: 1.3.6.1.4.1.14882.2.1.3 Value: <changed Gateway>
SSID	Object Identifier: 1.3.6.1.4.1.14882.5.1.3.3 Value: <changed SSID>
Radio Mode	Object Identifier: 1.3.6.1.4.1.14882.5.1.18 Value: <changed Radio Mode> Note: Possible values for radio mode are given in the table below.

Value	airHaul	airPoint™	airClient™
0	Remote Router		Router
1	Remote Bridge		Bridge
2			
3	Root Bridge	Bridge	
4			NAT

Appendix E – SNMP MIB

The airHaul device Mib can be downloaded at http://www.smartbridges.com/support/ah_nexus.asp . It contains all the MIB files used in the device.

How to use the MIB files?

The user can use a MIB browser/compiler (available on the Internet) to convert the text file definitions to the proper OID form. This OID will be of form .1.3.1.6.1.4.1.14882.1.2. etc. The user can use snmpget, snmpset or snmpwalk to obtain and set the various values.

MIB browser errors

The directories contain an exhaustive listing of all the required and dependent MIB files. However , it is possible that at times the MIB browser gives an error that it requires a particular MIB file. This MIB file will be standard MIB files which can be downloaded from the net. They are defined by RFCs and are readily available.

Some MIB browsers may give errors in the NEXUS MIB files (NEXUS-MIB, RADIO-MIB, SLA-MIB, QOS-MIB, DHCP-MIB, ROUTE-MIB). In such an event , try compiling with all the comments removed. (Comments start with a --).

The important MIB files

The NEXUS-MIB ,RADIO-MIB, DHCP-MIB, BRIDGE-MIB and SLA-MIB are common to all the products.

The user can start with these two files first. NEXUS-MIB is the parent of all other NEXUS MIB files and is required before compiling any other of the NEXUS MIB files.

Who can access the OIDs

User needs to know the IP address , the community password and the OID name/number to get/set values from/on the device. User may use the OID name (Eg. sbaRadioInterfaceName) or the complete OID number (.1.3.1.6.1.4.1.14882.5.1.16.0)

Caveat

The MIB files may change over time. User should get in touch with the Technical Support group to get the latest MIB files.

Sometimes the MIB browser does not recognize RFC-1212 MIB file. In such an event, either alias this file to RFC1155-SMI (if alias option is provided by the browser) or replace RFC-1212 by RFC1155-SMI in all the MIB files.

For more information, please contact the Technical Support Centre at support@smartBridges.com

Appendix F – License

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